Akbar M. Sayeed

Independent Researcher & Consultant
Madison, WI
Email: akbarmsayeed@gmail.com; Tel: 608-417-9807
Webpage: https://amsayeed.wordpress.com/
LinkedIn: https://linkedin.com/in/ams360
Google Scholar: 17,650+ citations; h-index: 53
Last Revised September 13, 2023.

Research Interests

Wireless communication and sensing, multipath wave propagation, wireless channel modeling, measurement and estimation, communication and information theory, statistical signal processing, machine learning, harmonic analysis, time-frequency representations, quantum information science and engineering, prototyping, testbeds, and technology development. A current focus is the development of basic theory, system architectures, and testbeds for emerging wireless technologies (5G, 6G, XG), including millimeter-wave and Terahertz wireless, high-dimensional multi-antenna multiple input multiple output (MIMO) systems, and communication and sensing in highly dynamic environments. Dr. Sayeed has a broad experience in these areas ranging from fundamental theoretical concepts and techniques to signal processing algorithm development to conception, design, and hardware prototyping of solutions. Dr. Sayeed relishes challenging technical and research problems, troubleshooting and finding innovative solutions that often require learning new concepts and tools and connecting-the-dots across different areas and fields.

Professional Background and Experience

Dr. Sayeed is an Independent Researcher and Technical Consultant, and a former Professor of Electrical and Computer Engineering at the University of Wisconsin-Madison, where he directed the *Wireless Communications and Sensing Laboratory* from 1997-2021. In particular, Dr. Sayeed pioneered the concept of beamspace MIMO (https://amsayeed.wordpress.com/the-cap-mimo-project/millimeter-wave-mimo/) and led a team at UW-Madison on developing the concept, including a state-of-the-art prototype at millimeter-wave frequencies, resulting in multiple compelling proof-of-concept demonstrations at 28 GHz; https://amsayeed.wordpress.com/the-cap-mimo-project/the-cap-mimo-project-2/, https://amsayeed.wordpress.com/the-cap-mimo-project/gen-2-28ghz-cap-mimo-prototype/, https://amsayeed.wordpress.com/the-cap-mimo-project/695-2/. He also led the creation of the *NSF Research Coordination Network on Millimeter-Wave Wireless Technology* in October 2016 (https://mmwrcn.ece.wisc.edu/). Dr. Sayeed served as a Program Director (2017-2019) at the *National Science Foundation (NSF)* in the Communications, Circuits, and Sensing Systems (CCSS) Program of the Electrical, Communications and Cyber Systems (ECCS) Division of the Engineering Directorate. At the NSF, Dr. Sayeed's program portfolio covered a broad range of topics spanning communications, sensing, signal processing, imaging, and integrated design of hardware and algorithms for information processing systems. He was an active member of the Electromagnetic Spectrum Management (ESM) working group, and the working groups of two of the 10 NSF Big Ideas: 1) The *Quantum Leap* Working Group which was an NSF-wide effort for developing new cross-disciplinary initiatives for advancing Quantum Information Science and Engineering, and 2) The *Harnessing the Data Revolution* Working Group which was an NSF-wide effort for developing new cross-disciplinary initiatives for advancing Data Science and Engineering. In particular, he co-led the team that developed the NSF solicitation for the *Quantum Leap Challenge Institutes* (released Feb 2019) in response to the *National Quantum Initiative (NQI)* Act signed by President Trump in December 2018. Dr. Sayeed also served on a 2019 panel, convened by the *National Academies of Sciences, Engineering and Medicine (NASEM)*, for reviewing the *Communications Technology Laboratory* of the *National Institute of Standards and Technology (NIST)*.

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Education

1996	University of Illinois-Urbana	Ph.D. in Electrical and Computer Engineering
1993	University of Illinois-Urbana	M.S. in Electrical and Computer Engineering
1991	University of Wisconsin-Madison	B.S. in Electrical and Computer Engineering

Positions

2020-present	Self-Employed	Independent Researcher & Consultant
1/23-present	Jawbone Innovations, LLC (part-time)	Technical Expert
4/23-present	Beamlink, Inc. (part-time)	R &D Consultant & Advisor
3/22-10/22	Silvus Technologies (part-time)	Director of R & D Business Development
2/20-12/21	A High-Speed Trading Company (part-time)	Wireless R & D Consultant
2008-2021	University of Wisconsin-Madison	Professor
11/17-4/19	National Science Foundation	Program Director
2003-2008	University of Wisconsin-Madison	Associate Professor
1997-2003	University of Wisconsin–Madison	Assistant Professor
1996–1997	Rice University	Postdoctoral Research Fellow
1991–1996	University of Illinois–Urbana	Research Assistant

Awards and Honors

2021	Donald Fink Overview Paper Award, IEEE Signal Processing Society
2017-19	Program Director, National Science Foundation
2018	Best Paper Award, Signal Processing for Communications Symposium, IEEE ICC
2016-19	Principal Investigator, National Science Foundation Research Coordination Network on Millimeter-Wave Wireless Technology
2016	Invited Participant of a Kickoff Event for a new $400M, 7-year NSF-led Advanced Wireless Research Initiative
2015	Steering Committee Member: NSF Workshop on the *Enhancing Access to the Radio Spectrum (EARS)* program
2012	IEEE Fellow
2003	UW Grainger Electrical and Computer Engineering Junior Faculty Fellowship
2001	Office of Naval Research Young Investigator Award
1999	National Science Foundation Faculty Early CAREER Development Award
1996	Robert T. Chien Memorial Award for outstanding Ph.D. research (U. Illinois)
1992–1995	Schlumberger Fellowship (U. Illinois)

Patents and Invention Disclosures

[1] A. Sayeed and J. Brady, *Differential MIMO Transceiver*, US Patent No. 10,284,339, issued May 2019.

[2] A. Sayeed, *Radiator Localization*, US Patent No. 9,763,216, issued September 12, 2017.

[3] A. Sayeed and J. Brady, *Wideband Transceiver for Antenna Arrays*, US patent No. 9,444,532, issued September 13, 2016.

[4] A. Sayeed and N. Behdad, *Continuous Aperture Phased MIMO*, US patent No. 8,811,511 issued August 19, 2014.

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[5] W. Bajwa, A. Sayeed, R. Nowak and J. Haupt, *Method for Probing and Learning Sparse Multipath Wireless Channels*, US Patent No. 8,320,489, issued on Nov. 27, 2012.

[6] A. Sayeed and V. Raghavan, *Method and Apparatus for Maximizing Capacity of Multi-Antenna Communication Systems with Reconfigurable Antenna Arrays*, US patent No. 8,000,732, issued on August 16, 2011.

[7] A. Sayeed and T. Sivanadyan, *Active Wireless Sensing: Method for Rapid Information Retrieval From an Ensemble of Wireless Sensors*, US patent No. 7,881,671 issued on Feb. 1, 2011.

[8] K. Liu and A. M. Sayeed, *Layered Space-Time Processing in a Multiple Antenna System*, US patent No. 7,218,906 issued on May 15, 2007.

[9] E. N. Onggosanusi, B. D. Van Veen and A. M. Sayeed, *Channel Aware Optimal Space-Time Signaling for Wireless Communication Over Wideband Multipath Channels*, US patent No. 7,110,378 issued on September 19, 2006.

[10] T. A. Kadous and A. M. Sayeed, *Method and System for Multi-Carrier Multiaccess Reception in the Presence of Imperfections*, US patent No. 6,654,408 issued on November 25, 2003.

Professional Activities

Member:	IEEE (Fellow), Eta Kappa Nu, Tau Beta Pi
Member:	*NIST Next-G Channel Modeling Alliance* (2016-present)
Associate Editor:	*IEEE Transactions on Signal Processing* (2013-2015)
Associate Editor:	*IEEE Signal Processing Letters* (1999-2002)
Guest Editor:	*IEEE Journal of Selected Areas in Communications (special issue on Advances in Quantum Communications, Computing, Cryptography and Sensing)*; S. Ng, A. Conti, J. Yuan, P. Mueller, G.-L. Long, and A. Sayeed (2019-20) *IEEE Journal of Selected Topics in Signal Processing (special issue on signal processing for millimeter-wave wireless communication)*; R. Heath, N. Gonzalez-Prelcic, S. Rangan, W. Roh, and A. Sayeed (2015-16) *IEEE Journal of Selected Topics in Signal Processing (special issue on Signal Processing and Networking for Dynamic Spectrum Access)*; A. Swami, R. Berry, A. Sayeed, V. Tarokh and Q. Zhao (2008) *IEEE Journal on Selected Areas in Communications (special issue on Self-organizing Distributed Collaborative Sensor Networks)*; A. Sayeed, D. Estrin, G. Pottie, and K. Ramchandran (2005)
Technical Committees:	Signal Processing for Communications and Networking Technical Committee of the IEEE Signal Processing Society (2007-2012)
Technical Program Committees:	2021 **Symposium Co-Chair**, Quantum Communications and Computing, IEEE Global Communications Conference 2020 **Technical Program Committee**, Quantum Communications, Sensing and Cryptography Track, IEEE International Conference on Quantum Computing and Engineering (IEEE Quantum Week) 2019 **Workshop Facilitator**, Sixth Workshop of the NSF Research Coordination Network on Millimeter-Wave Wireless Technology 2018 **Workshop Co-Chair**, IEEE VTC Workshop on Millimeter-Wave Channel Measurement, Modeling, and Systems

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2018 **Workshop Facilitator**, Fourth Workshop of the NSF Research Coordination Network on Millimeter-Wave Wireless Technology

2018 **Workshop Facilitator**, Third Workshop of the NSF Research Coordination Network on Millimeter-Wave Wireless Technology

2017 **Workshop Co-Chair**, IEEE VTC Workshop on Millimeter-Wave Channel Measurement, Modeling, and Systems

2017 **Workshop Co-Chair**, Second Workshop of the NSF Research Coordination Network on Millimeter-Wave Wireless Technology

2016 **Workshop Co-Chair**, Kickoff Workshop of the NSF Research Coordination Network on Millimeter-Wave Wireless Technology

2016 **Workshop Co-Chair**, IEEE Globecom Workshop on 5G Wireless Channel Modeling

2016 **Workshop Co-Chair**, IEEE VTC Workshop on Millimeter-Wave Channel Modeling

2014 **Technical Program Co-Chair**, IEEE Workshop on Signal Processing Advances for Wireless Communications (SPAWC)

2007-2013, IEEE Workshop on Signal Processing Advances for Wireless Communications (SPAWC)

2007-2013, IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)

2011 IEEE International Symposium on Information Theory (ISIT), St. Petersburg, Russia

2010 International Conference on Cognitive Radio Oriented Wireless Networks and Communications (CrownCom), Cannes, France

2009 IEEE GLOBECOM, Hawaii

2008 **Technical Program Track Chair**, Asilomar Conference on Signals, Systems and Computers, Pacific Grove, CA

2008 IEEE GLOBECOM, New Orleans

2008 **Technical Program Co-chair**, IEEE Communication Theory Workshop, St. Croix, US Virgin Islands

2007 **Technical Program Co-chair**, IEEE Statistical Signal Processing Workshop, Madison, WI

2005 ACM Conference on Embedded Networked Sensing Systems (SenSys), San Diego

2005 IEEE Global Communications Conference (GLOBECOM), St. Louis

2005 IEEE Workshop on Signal Processing Advances for Wireless Communications (SPAWC), New York

2004 25-th IEEE International Real-Time Systems Symposium (RTSS), Portugal, Lisbon

2004 International Symposium on Information Processing in Sensor Networks (IPSN), April, Berkeley, CA

2003 IEEE International Conference on Communications (ICC), 2003, Alaska

Fall 2002 IEEE Vehicular Technology Conference (VTC), Vancouver, Canada

Session Organizer: Millimeter-Wave Wireless Systems, 2018 IEEE Workshop on Signal Processing Advanced for Wireless Communications (SPAWC)

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	Millimeter-Wave MIMO Wireless Systems, 2017 Asilomar Conference
	5G Wireless Panel, 2014 IEEE Workshop on Signal Processing Advances in Wireless Communications (SPAWC 2014)
	Cognitive Wireless Communication and Sensing in Networks, 2006 Military Communications Conference (MILCOM 2006); with B. Daneshrad (UCLA)
Reviewer:	Various journals and conferences in communications and signal processing, National Science Foundation, Army Research Office, Australian Research Council, Vienna Research Fund, Austrian Research Council, Canadian Research Council, and the United Arab Emirates University
Panelist:	NSF ERC Mock Site Visit Review Panel, Worcester Polytechnic Institute, Oct 2019
	National Academies of Sciences, Engineering and Medicine (NASEM) Panel for Reviewing the Communications Technology Laboratory of the National Institute of Standards and Technology (NIST), July 2019
	Millimeter-wave (mmWave) Measurement and Modeling, International Symposium on Advanced Radio Technologies: Spectrum Mining at mmWave - Digging for Capacity (2017)
	Huawei University Days (2016)
	5G Densification and Enabling Technology, TIA Annual Meeting (2016)
	IEEE WCNC Workshop on Millimeter-Wave Wireless (2016)
	NSF Workshop on Distributed Sensor Networks (2002)
	NSF/ONR Workshop on Signal Processing for Manufacturing and Machine Monitoring (1996)
Meetings Attended:	Fifth Workshop on Scalable Information Processing with Quantum Nano-Photonics (SIPQNP), Tuscon, AZ, Mar. 2019
	NAS Workshop on Enabling Technologies for Quantum Systems, Washington DC, Mar. 2019
	U. Chicago Quantum Summit, Nov. 8, 2018
	THz Technologies Workshop, Brown U, Oct., 2018
	Optical Society of America (OSA) Annual Meeting , Washington, DC, Sep. 2018
	DOE Workshop on Quantum Communication Networks, Aug. 2018
	NSF Quantum Information Workshop (Industry-Academic Collaboration), ICT USC, Los Angeles, Mar. 2018

Book Chapters

[1] A. M. Sayeed and J. Brady, "Millimeter-Wave Wireless Transceivers: Theory, Design, and Implementation," *Signal Processing for 5G: Algorithms and Implementations*, (F.-L Luo and J. Zhang, eds.), IEEE-Wiley, 2016.

[2] A. M. Sayeed and T. Sivanadyan, "Wireless Communication and Sensing in Multipath Environments Using Multi-antenna Transceivers," *Handbook on Sensor and Array Processing*, (S. Haykin and R. Liu, eds.), IEEE-Wiley, 2010.

[3] A. M. Sayeed, "Object Detection and Classification in Sensor Networks," in *Frontiers in Distributed Sensor Networks* (R. Brooks and S. Iyengar, eds.), CRC Press, 2004.

[4] A. M. Sayeed, "Communication over Linear Dispersive Channels: A Time-Frequency Perspective,"in *Time Frequency Signal Analysis and Processing* (B. Boashash ed.), pp. 549-557, Elsevier, Nov. 2003.

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[5] A. M. Sayeed, "Optimal Time-Frequency Detectors," in *Time-Frequency Signal Analysis and Processing* (B. Boashash ed.), pp. 500-509, Elsevier, Nov. 2003.

[6] A. M. Sayeed and B. Aazhang, "Communication over Multipath Fading Channels: A Time-Frequency Perspective," in *Wireless Communications: CDMA versus TDMA* (S. G. Glisic and P. A. Leppanen eds.), pp. 73–98, Kluwer Academic Publishers, 1997.

Technical Reports

[1] J. Brady, N. Behdad, and A. Sayeed, "Beamspace MIMO for Millimeter-Wave Communications: System Architecture, Modeling, Analysis, and Measurements," UW-ECE Technical Report, May 2012.

[2] Y. Zhou, M. Herdin, A. M. Sayeed and E. Bonek, "Experimental Study of MIMO Channel Statistics and Capacity via the Virtual Channel Representation," UW-ECE Technical Report, February 2007.

[3] J. Kotecha and A. M. Sayeed, "Canonical Statistical Modeling and Capacity Analysis of Correlated MIMO Channels," UW-ECE Technical Report, February 2004.

[4] A. M. Sayeed, "A Statistical Signal Modeling Framework for Integrated Design of Sensor Networks," UW-ECE Technical Report, October 2003.

Journal Publications

[1] A. Sayeed, D. Guven, M. Doebereiner, S. Semper, C. Gentile, A. Bodi, and Z. Cheng, "A Framework for Developing and Evaluating Algorithms for Estimating Multipath Propagation Parameters from Channel Sounder Measurements", *IEEE Transactions on Wireless Communications*, accepted for publication, 2023.

[2] S. Ng, A. Conti, G.-L. Long, P. Muller, A. Sayeed, J. Yuan, and L. Hanzo, "Guest Editorial: Advances in Quantum Communications, Cryptography, Computing and Sensing", *IEEE Journal Selected Areas in Communications* , March 2020.

[3] X. Gao, L. Dai, S. Zhou, A. Sayeed and L. Hanzo, "Wideband Beamspace Channel Estimation for Millimeter-Wave MIMO Systems Relying on Lens Antenna Arrays", *IEEE Transactions on Signal Processing*, pp. 4809-4824, July 2019.

[4] X. Gao, L. Dai, A. Sayeed, "Low RF-Complexity Technologies to Enable Millimeter-Wave MIMO with Large Antenna Array for 5G Wireless Communications", *IEEE Communications Magazine*, April 2018.

[5] R. Heath, N. Gonzalez-Prelcic, S. Rangan, W. Roh, and A. Sayeed, "An Overview of Signal Processing Techniques for Millimeter-Wave MIMO Systems", *IEEE Journal on Selected Topics in Signal Processing* , April 2016.

[6] H. Mehrpouyan, M. R. Khanzadi, M. Matthaiou, A. Sayeed, R. Schober, and Y. Hua, "Improving Bandwidth Efficiency in E-band Communication Systems," *IEEE Communications Magazine*, March 2014.

[7] A. Fish, S. Gurevich, R. Haddani, A. Sayeed, and O. Schwartz, "Delay-Doppler Channel Estimation in Almost Linear Complexity," *IEEE Transactions on Information Theory*, November 2013.

[8] T.-H. Chou, S. Draper and A. Sayeed, "Secret Key Generation from Sparse Wireless Channels: Ergodic Capacity and Secrecy Outage," *IEEE Journal on Selected Areas in Communications*, pp. 1751-1764 September 2013.

[9] M. Malloy and A. Sayeed, "Re-visiting Spread Spectrum Detection in Multipath," *IEEE Transactions on Signal Processing*, pp. 4330-4340, September 2013.

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[10] J. Brady, N. Behdad, and A. Sayeed, "Beamspace MIMO for Millimeter-Wave Communications: System Architecture, Modeling, Analysis, and Measurements," *IEEE Transactions on Antennas and Propagation*, pp. 3814-3827, July 2013.

[11] Y. Liu, S.C. Draper, and A.M. Sayeed, " Exploiting Channel Diversity for Secret Key Generation From Multipath Fading Randomness", the *IEEE Transactions on Information Forensics and Security*, pp.1484-1497, October 2012.

[12] T.-H. Chou, S. Draper, and A. Sayeed, "Key Generation Using External Source Excitation: Capacity, Reliability and Secrecy Exponent", *IEEE Transactions on Information Theory*, pp. 2455-2474, April 2012.

[13] V. Raghavan, A. Sayeed, and V. Veeravalli, "Semiunitary Precoding for Spatially Correlated MIMO Channels," *IEEE Transactions on Information Theory*, pp. 1284-1298, March 2011.

[14] V. Raghavan and A. Sayeed, "Sub-linear Capacity Scaling Laws for Sparse MIMO Channels," *IEEE Transactions on Information Theory*, pp. 345-364, January 2011.

[15] V. Raghavan, J. Kotecha and A. Sayeed, "Why Does the Kronecker Model Result in Misleading Capacity Estimates?," *IEEE Transactions on Information Theory*, pp. 4843-4864, October 2010.

[16] W. Bajwa, J. Haupt, A. Sayeed, and R. Nowak, "Compressed Channel Sensing: A New Approach to Estimating Sparse Multipath Channels," *Proc. IEEE (special issue on Sparse Signal Processing)*, June 2010. **Invited**.

[17] T. Sivanadyan and A. M. Sayeed, "Active Wireless Sensing: A Versatile Framework for Information Retrieval in Sensor Networks," *IEEE Transactions on Signal Processing*, Jan 2010.

[18] M. Matthaiou, Y. Kopsinis, D. Laurenson and A. Sayeed, "Ergodic Capacity Upper Bound for Dual MIMO Ricean Systems: Simplified Derivation and Asymptotic Tightness," *IEEE Transactions on Communications*, Dec. 2009.

[19] K. Liu, Z. Hong, N. Boston, and A. Sayeed, "Space-Time Code Design Based on Algebraic Number Theory," *IEEE Transactions on Information Theory*, June 2009.

[20] V. Raghavan, V. Veeravalli and A. Sayeed, "Quantized Multimode Precoding in Spatially Correlated Multi-Antenna Channels," *IEEE Transactions on Signal Processing*, Dec. 2008.

[21] G. Hariharan, V. Raghavan, and A. M. Sayeed, "Capacity of Sparse Wideband Channels with Partial Channel Feedback," *European Transactions on Telecommunications* (special issue on New Directions in Information Theory), April 2008.

[22] W. Bajwa, J. Haupt, A. Sayeed and R. Nowak, "Joint Source-Channel Communication for Distributed Estimation in Sensor Networks," *IEEE Transactions on Information Theory* (special issue on Models, Theory and Codes for Relaying and Cooperation in Communication Networks), pp. 3629-2653, Oct. 2007.

[23] V. Raghavan, G. Hariharan, and A. Sayeed, "Capacity of Sparse Multipath Channels in the Ultra-Wideband Regime," *IEEE Journal on Selected Topic in Signal Processing* (special issue on Performance Limits of Ultra-Wideband Systems), pp. 357-371, Oct. 2007.

[24] V. Raghavan, R. Heath, and A. Sayeed, "Systematic Codebook Designs for Quantized Beamforming in Correlated MIMO Channels," *IEEE Journal on Selected Areas in Communications* (special issue on Optimization of MIMO Transceivers for Realistic Communication Networks), pp. 1298-1310, September 2007.

[25] K. Liu, H. El Gamal and A. Sayeed, "Decentralized Inference Over Multiple Access Channels," *IEEE Transactions on Signal Processing*, pp. 3445-3455, July 2007.

[26] A. Sayeed and V. Raghavan, "Maximizing MIMO Capacity in Sparse Multipath with Reconfigurable Antenna Arrays," *IEEE Journal on Special Topics in Signal Processing* (special issue on Adaptive Waveform Design for Agile Communications and Sensing), pp. 156-166, June 2007.

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[27] K. Liu and A. Sayeed, " Type-based Decentralized Detection in Wireless Sensor Networks," *IEEE Transactions on Signal Processing*, pp. 1899-1910, May 2007.

[28] V. Raghavan and A. Sayeed, "Weak Convergence and Rate of Convergence of MIMO Capacity Random Variable," *IEEE Transactions on Information Theory*, vol. 52, no. 8, pp. 3799-3809, August 2006.

[29] Y. Zhou and A. M. Sayeed, "Theoretical Study of Mobile Station Multi-polarization Antenna Diversity," the *IEEE Transactions on Vehicular Technology*, pp. 256-269, Jan. 2006.

[30] K. Liu and A. M. Sayeed, "An Iterative Extension of BLAST Decoding Algorithm for Layered Space-Time Signals," *IEEE Transactions on Communications*, pp. 1754-1761, October 2005.

[31] Y. Zhou, S. Rondineau, D. Popović, A. Sayeed, and Z. Popović, "Virtual Channel Space-Time Processing With Dual-Polarized Discrete Lens Antenna Arrays," *IEEE Transactions on Antennas and Propagation* (special issue on Antennas and Propagation Applications), pp. 2444-2455, August 2005.

[32] Y. Liang, V. Veeravalli, A. Sayeed, "Correlated MIMO Wireless Channels: Capacity, Optimal Signaling and Asymptotics," *IEEE Transactions on Information Theory*, vol. 5, pp. 2058-2072, June 2005.

[33] J. Zhang, A. M. Sayeed, and B. D. Van Veen, "Reduced state MIMO sequence estimation with applications to EDGE Systems,"*IEEE Transactions on Wireless Communications*, pp. 1040-1049, May 2005.

[34] J. Kotecha, V. Ramachandran and A. Sayeed, "Distributed Multi-target Classification in Wireless Sensor Networks," the *IEEE Journal on Selected Areas in Communications* (special issue on sensor networks), pp. 703-713, April 2005.

[35] J. Zhang, A. M. Sayeed, and B. D. Van Veen, "Optimal Space-Time Transceiver Design for Selective Wireless Broadcast with Channel Side Information," *IEEE Transactions on Wireless Communications*, pp. 2040-2050, Nov. 2004.

[36] K. Liu, T. Kadous and A. M. Sayeed, "Orthogonal Time-Frequency Signaling for Doubly Dispersive Channels," *IEEE Transactions on Information Theory*, pp. 2583-2603, Nov. 2004.

[37] A. D'Costa, V. Ramachandran and A. Sayeed,"Distributed Classification of Gaussian Space-Time Sources in Wireless Sensor Networks," *IEEE Journal on Selected Areas in Communications* (special issue on sensor networks), pp. 1026-1036, August 2004.

[38] T. Kadous and A. M. Sayeed, "An Integrated Framework for OFDM Reception in the Presence of Phase Noise, Frequency Offsets and Fast Fading," the *IEEE Transactions on Wireless Communications*, vol. 3, issue 4, pp. 1224-1235, July 2004.

[39] K. Liu and A. M. Sayeed, "Space-Time D-Block Codes via the Virtual MIMO Channel Representation," the *IEEE Transactions on Wireless Communications*, vol.3, pp. 982-991, May 2004.

[40] J. H. Kotecha and A. M. Sayeed, "Transmit Signal Design for Optimal Estimation of Correlated MIMO Channels," *IEEE Transactions on Signal Processing*, pp. 546-557, Feb. 2004.

[41] K. Liu, V. Raghavan and A. M. Sayeed, "Capacity Scaling and Spectral Efficiency in Wideband Correlated MIMO Channels," *IEEE Transactions on Information Theory* (special issue on MIMO systems), pp. 2504-2526, October 2003.

[42] R. Brooks, P. Ramanathan and A. M. Sayeed, "Distributed Target Classification and Tracking in Sensor Networks," *Proceedings of the IEEE*, pp. 1163-1171, August 2003. **Invited**.

[43] Z. Hong, K. Liu, R. Heath, A. M. Sayeed, "Spatial Multiplexing in Correlated Fading Via the Virtual Channel Representation," *IEEE Journal on Selected Areas in Communications* (special issue on MIMO Systems and Applications), vol. 21, no. 5, pp. 856-866, June 2003.

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[44] A. Ganesan and A. M. Sayeed, "A Virtual Input-Output Framework for Transceiver Analysis and Design for Multipath Fading Channels," *IEEE Transactions on Communications*, pp. 1149-1161, June 2003.

[45] E. N. Onggosanusi, A. M. Sayeed, and B. D. Van Veen, "Efficient Signaling Schemes for Wideband Space-Time Wireless Channels Using Channel State Information," *IEEE Transactions on Vehicular Technology*, pp. 1-13, Jan. 2003.

[46] T. Kadous and A. M. Sayeed, "Equivalence of Linear MMSE Detection in DS-CDMA and MC-CDMA Systems Over Time and Frequency Selective Channels," *EURASIP Journal on Applied Signal Processing* (special issue on multiuser detection), vol. 2002, no. 12, pp. 1335-1354, December 2002.

[47] A. M. Sayeed, "Deconstructing Multi-Antenna Fading Channels," *IEEE Transactions on Signal Processing*, vol. 50, no. 10, pp. 2563-2579, October 2002.

[48] M. Baissas and A. M. Sayeed, "Pilot-Based Estimation of Time-Varying Multipath Channels for Coherent CDMA Receivers," *IEEE Transactions on Signal Processing*, vol. 50, no. 8, pp. 2037-2049, August 2002.

[49] E. N. Onggosanusi, A. M. Sayeed, and B. D. Van Veen, "Multiaccess Interference Suppression in Canonical Space-Time Coordinates: A Decentralized Approach," *IEEE Transactions on Communications*, vol. 50, no. 5, pp. 833-844, May 2002.

[50] D. Li, K. Wong, Y. H. Hu, and A. M. Sayeed, "Detection, Classification and Tracking of Targets in Distributed Sensor Networks," *IEEE Signal Processing Magazine*, vol. 19, no. 2, pp. 17-29, March 2002. **Invited.**

[51] E. N. Onggosanusi, A. M. Sayeed, and B. D. Van Veen, "Optimal Antenna Diversity Signaling for Wideband Systems Utilizing Channel Side Information," *IEEE Transactions on Communications*, vol. 50, no.2, pp. 341-353, February 2002.

[52] T. A. Kadous and A. M. Sayeed, "Decentralized Multiuser Detection for Time-Varying Multipath Channels," *IEEE Transactions on Communications*, pp. 1840-1852, November 2000.

[53] E. N. Onggosanusi, A. M. Sayeed and B. D. Van Veen, "Canonical Space-Time Processing for Wireless Communications," *IEEE Transactions on Communications*, pp. 1669-1680, October 2000.

[54] S. Bhashyam, A. M. Sayeed, and B. Aazhang, "Time-Selective Signaling and Reception over Multipath Fading Channels," *IEEE Transactions on Communications*, pp. 83-94, January 2000.

[55] B. S. Krongold, A. M. Sayeed, M. Moehring, J. A. Ritcey, M. Spencer, and D. L. Jones, "Time-Scale Detection of Microemboli in Flowing Blood with Doppler Ultrasound," *IEEE Transactions on Biomedical Engineering*, pp. 1081-1089, September 1999.

[56] A. M. Sayeed, E. N. Onggosanusi and B. D. Van Veen, "A Canonical Space-Time Characterization of Mobile Wireless Channels," *IEEE Communications Letters*, pp. 94-96, April 1999.

[57] A. M. Sayeed and B. Aazhang, "Joint Multipath-Doppler Diversity in Mobile Wireless Communications," *IEEE Transactions on Communications*, pp. 123-132, January 1999.

[58] A. M. Sayeed, A. Sendonaris, and B. Aazhang, "Multiuser Detection in Fast Fading Multipath Environments," *IEEE Journal on Selected Areas in Communications (Special Issue on Signal Processing for Wireless Communications)* , pp. 1691-1701, December 1998.

[59] A. M. Sayeed, "On the Equivalence of the Operator and Kernel Methods for Joint Distributions of Arbitrary Variables," *IEEE Transactions on Signal Processing*, vol. 45, pp. 1067–1070, April 1997.

[60] A. M. Sayeed and D. L. Jones, "Equivalence of Generalized Joint Signal Representations of Arbitrary Variables," *IEEE Transactions on Signal Processing*, vol. 44, pp. 2950–2970, December 1996.

[61] A. M. Sayeed and D. L. Jones, "Optimum Quadratic Detection and Estimation Using Generalized Joint Signal Representations," *IEEE Transactions on Signal Processing*, pp. 3031–3043, December 1996.

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[84] E. N. Onggosanusi, B. D. Van Veen, and A. M. Sayeed, "High Throughput Wideband Space-Time Signaling Using Channel State Information," *2001 International Conference on Acoustics, Speech and Signal Processing*, vol. 4, pp. 2421-2424, Salt Lake City, Utah, May 2001.

[85] T. A. Kadous and A. M. Sayeed, "A New Scheme for MC-CDMA Systems in the Presence of Imperfections," *34th Asilomar Conference on Signals, Systems, and Computers*, vol. 1, 797-801, November 2000.

[86] A. Ganesan and A. M. Sayeed, "A Virtual MIMO Framework for Multipath Fading Channels," *34th Asilomar Conference on Signals, Systems, and Computers*, vol. 1, 537-541, November 2000.

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[87] E. N. Onggosanusi, B. D. Van Veen and A. M. Sayeed, "Optimal Spread Spectrum Transmit Antenna Diversity Utilizing Channel State Information," *34th Asilomar Conference on Signals, Systems, and Computers*, vol. 1, 106-110, November 2000.

[88] A. Ganesan and A. M. Sayeed, "On Bandwidth-Efficient Communication Over Frequency Selective Channels," *38th Annual Allerton Conference on Communications, Control and Computing*, October 2000.

[89] E. N. Onggosanusi, B. D. Van Veen and A. M. Sayeed, "Efficient Use of Wideband Spatio-Temporal Wireless Channels Given Channel State Information," *38th Annual Allerton Conference on Communications, Control and Computing*, October 2000.

[90] A. Ganesan and A. M. Sayeed, "Bandwidth-Efficient Exploitation of the Degrees of Freedom in a Multipath Fading Channel," *2000 International Symposium on Information Theory*, pp. 161, Sorrento, Italy, June 2000.

[91] M. Baissas and A. M. Sayeed, "Pilot-Based Estimation of Time-varying Multipath Channels," *2000 IEEE International Conference on Acoustics, Speech and Signal Processing*, vol. 5, pp. 2657-2660, Istanbul, Turkey, June 2000.

[92] B. D. Van Veen, A. M. Sayeed, and E. N. Onggosanusi, "Interference Resistant Blind Acquisition and Channel Estimation for CDMA Communication Systems," *2000 IEEE International Conference on Acoustics, Speech and Signal Processing*, vol. 5, pp. 2913-2916, Istanbul, Turkey, June 2000.

[93] E. N. Onggosanusi, A. M. Sayeed, and B. D. Van Veen, "Spatio-Temporal Polarization Signaling for Multipath Spread-Spectrum Channels," *2000 IEEE International Conference on Acoustics, Speech and Signal Processing*, vol. 5, 2837-2840, Istanbul, Turkey, June 2000.

[94] T. A. Kadous and A. M. Sayeed, "Progressively Powerful Multiuser Detectors for Rapidly Time-Varying Multipath Environments," *IEEE Global Telecommunications Conference*, Rio de Janeiro, Brazil, December 1999.

[95] E. N. Onggosanusi, A. M. Sayeed and B. D. Van Veen, "Canonical Space-Time Coordinates for Multiuser Wireless Communications," Proceedings of the *2nd IEEE Workshop on Signal Processing Advances in Wireless Communications*, Annapolis, MD, May 1999.

[96] E. N. Onggosanusi, A. M. Sayeed and B. D. Van Veen, "Canonical Space-Time Processing in CDMA Systems," Proceedings of the *1999 International Conference on Acoustics, Speech, and Signal Processing*, Phoenix, AZ, March 1999.

[97] A. M. Sayeed, "An Integrated Signal Processing Framework for Multiuser CDMA Communications," Proceedings of the *1999 International Conference on Acoustics, Speech, and Signal Processing*, Phoenix, AZ, March 1999.

[98] A. M. Sayeed, "Canonical Time-Frequency Processing for Broadband Signaling Over Dispersive Channels," Proceedings of the *1998 IEEE International Symposium on Time-Frequency and Time-Scale Analysis*, October, 1998.

[99] J. P. Gallaire and A. M. Sayeed, "Interference-Resistant Detection Based on Time-Frequency Subspaces," Proceedings of the *1998 IEEE International Symposium on Time-Frequency and Time-Scale Analysis*, October, 1998.

[100] J. P. Gallaire and A. M. Sayeed, "Wavelet-Based Empirical Wiener Filtering," Proceedings of the *1998 IEEE International Symposium on Time-Frequency and Time-Scale Analysis*, October, 1998.

[101] S. Bhasyam, A. M. Sayeed and B. Aazhang, "Time-Selective Signaling and Reception for Multipath Fading Channels," Proceedings of the *1998 International Symposium on Information Theory*, Boston, MA.

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[102] A. M. Sayeed and B. Aazhang, "Joint Multipath-Doppler Diversity in Fast Fading Channels," Proceedings of the *1998 International Conference on Acoustics, Speech, and Signal Processing*, Seattle, WA.

[103] A. M. Sayeed and B. Aazhang, "Multiuser Timing Acquisition over Multipath Fading Channels," Proceedings of the *1998 Conference on Information Sciences and Systems*, Princeton, NJ.

[104] A. M. Sayeed and B. Aazhang, "Exploiting Doppler Diversity in Mobile Wireless Communications," Proceedings of the *1997 Conference on Information Sciences and Systems*, Baltimore, MD.

[105] A. M. Sayeed, "Data-driven Nonstationary Detection and Classification," Proceedings of the *1997 IEEE International Conference on Acoustics, Speech and Signal Processing*, Munich, Germany, 1997.

[106] A. M. Sayeed and D. L. Jones, "Optimal Reduced-Rank Time-Frequency/Time-Scale Quadratic Detectors," Proceedings of the *1996 IEEE International Symposium on Time-Frequency and Time-Scale Analysis*, Paris, France, pp. 209-212, 1996.

[107] A. M. Sayeed and D. L. Jones, "A Simple Covariance-Based Characterization of Joint Signal Representations of Arbitrary Variables," Proceedings of the *1996 IEEE International Symposium on Time-Frequency and Time-Scale Analysis*, Paris, France, pp. 433-436, 1996.

[108] B. Samimy, G. Rizzoni, A. M. Sayeed, and D. L. Jones, "Design of Training Data-Based Quadratic Detectors with Application to Mechanical Systems," Proceedings of the *1996 IEEE International Conference on Acoustics, Speech and Signal Processing*, Atlanta, GA, vol. 3, pp. 1767–1770, 1996.

[109] A. M. Sayeed and D. L. Jones, "Generalized Joint Signal Representations and Optimum Detection," Proceedings of the *1996 IEEE International Conference on Acoustics, Speech and Signal Processing*, Atlanta, GA, vol. 3, pp. 1431–1434, 1996.

[110] A. M. Sayeed and D. L. Jones, "Time-Frequency Detectors," Proceedings of the *1996 Conference on Information Sciences and Systems*, Princeton, NJ, vol. 1, pp. 509–514, 1996.

[111] A. M. Sayeed, P. Lander, and D. L. Jones, "Improved Time-Frequency Filtering of Signal-Averaged Electrocardiograms," presented at the *20th Annual Conference on Research and Applications in Computerized Electrocardiology*, 1995.

[112] D. L. Jones and A. M. Sayeed, "Blind Quadratic and Time-Frequency Based Detectors from Training Data," Proceedings of the *1995 IEEE International Conference on Acoustics, Speech and Signal Processing*, Detroit, MI, vol. 2, pp. 1033–1036, 1995.

[113] A. M. Sayeed and D. L. Jones, "On the Equivalence of Generalized Joint Signal Representations," Proceedings of the *1995 IEEE International Conference on Acoustics, Speech and Signal Processing*, Detroit, MI, vol. 3, pp. 1533–1536, 1995.

[114] A. M. Sayeed and D. L. Jones, "Optimal Estimation of Time-Frequency Representations from Corrupted Observations," Proceedings of the *1994 IEEE International Symposium on Time-Frequency and Time-Scale Analysis,* Philadelphia, PA, pp. 456–459, 1994.

[115] A. M. Sayeed and D. L. Jones, "Optimal Quadratic Detection using Bilinear Time-Frequency and Time-Scale Representations," Proceedings of the *1994 IEEE International Symposium on Time-Frequency and Time-Scale Analysis*, Philadelphia, PA, pp. 365–368, 1994.

[116] A. M. Sayeed and D. L. Jones, "Optimal Kernels for Wigner-Ville Spectral Estimation," Proceedings of the *1994 IEEE International Conference on Acoustics, Speech and Signal Processing,* Adelaide, Australia, vol. IV, pp. 297–300, 1994.

Tutorial

"Wireless Sensor Networks," (with D. Estrin and M. Srivastava), *8th ACM Conference on Mobile Computing and Networking (Mobicom 2002)*, September 24, 2002.

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Keynote and Plenary Talks

"Millimeter-Wave Wireless: Recent Progress and Future Trends," *2019 IEEE DySPAN Workshop on mmWave Communications and Networks*, Nov. 14, 2019.

"Wideband (and Massive) MIMO for Millimeter-Wave Mobile Networks: Recent Results on Theory, Architectures, and Prototypes," Keynote Lecture, *Workshop on Millimeter Wave-Based Integrated Mobile Communications for 5G Networks*, *2017 IEEE Wireless Communication and Networking Conference*, San Francisco, March 2017.

"Multi-beam MIMO for Millimeter-Wave Wireless: Architectures, Prototypes, and 5G Use Cases," Keynote Lecture, *Workshop on Millimeter Wave-Based Integrated Mobile Communications for 5G Networks*, *2016 IEEE Wireless Communication and Networking Conference*, April 3, 2016, Doha, Qatar.

"Beamspace MIMO Architectures for Millimeter-Wave Wireless," Plenary Lecture, *International Workshop on Emerging MIMO Technologies* as part of *2015 IEEE International Conference on Computing, Networking and Communications (ICNC)*, Feb. 16, 2015, Annaheim, CA.

"Millimeter-Wave MIMO Architectures for 5G Wireless," Plenary Lecture at the *2014 IEEE Globecom Workshop on Emerging Technologies for 5G Wireless Cellular Networks*, Dec 8., 2014, Austin, TX.

"Wireless Sensor Networks: Interplay between Distributed Sensing, Communications and Learning", Keynote Lecture, *Picture Coding Symposium*, San Francisco, CA, December 15-17, 2004.

Invited Lectures and Presentations

"From Millimeter-Wave to Quantum Communication: A Call for Cross-Disciplinary Research and Technology Innovation," IEEE Quantum Communication and Information Technology Emerging Technical Sub-Committee Meeting, July 7, 2020.

"From Millimeter-Wave to Quantum Communication: A Call for Cross-Disciplinary Research and Technology Innovation," International Conference on Computing, Networking and Communications, Honolulu, February 20, 2019.

"Millimeter-Wave Wireless: Cross-Disciplinary Research and Technology Development," University of Illinois at Chicago, IEEE Antennas and Propagation and Microwave Theory and Techniques Societies, November 8, 2018.

"Communication Using Orbital Angular Momentum: Modulation, Propagation, and Fundamental Limits," Incubator Workshop on Orbital Angular Momentum, Optical Society of America, Washington, DC, August 9, 2018.

"Millimeter-Wave Wireless Research and Technology Development: Cross-Disciplinary Challenges and Opportunities," University of Washington, March 27, 2018.

"Millimeter-Wave Wireless: Cross-Disciplinary Challenges and Opportunities," George Mason University, March 23, 2018.

"Millimeter-Wave Wireless: A Cross-Disciplinary View of Research and Technology Development," First ACM Workshop on Millimeter-Wave Networks and Sensing Systems, Snowbird, UT, October 16, 2017.

"Millimeter-wave MIMO: Basic Theory, Architectures, and Technology Development," Huawei University Days, Chicago, Aug 4-5, 2016.

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"The Next Wireless Frontier: Challenges and Opportunities at Millimeter-wave and Higher Frequencies," Hawaii Center for Advanced Communication, University of Hawaii, December 2, 2014.

"Beamspace Communication Techniques and Architectures for Enabling Gigabit Mobile Wireless at Millimeter-wave Frequencies," NSF EARS (efficient access to the radio spectrum) program Kickoff Workshop, October 7-8, 2013.

"The Next Wireless Frontier: Challenges and Opportunities at Millimeter-wave and Higher Frequencies," Virginia Tech, April 22, 2013.

"The Next Wireless Frontier: Challenges and Opportunities at Millimeter-wave and Higher Frequencies," Iowa State University, April 13, 2012.

"Harnessing the Wireless Spectrum: Challenges and Opportunities," Washington State University, October 4, 2011.

"Harnessing the Wireless Spectrum: Opportunities and Challenges," Boston University, March 2009.

"Cognition and Security in Wireless Networks," LUMS School of Science and Engineering, Lahore, Pakistan, October 15, 2008.

"Capacity of Correlated MIMO Channels: Channel Power and Multipath Sparsity," Random Matrix Theory and Wireless Communications Workshop, Boulder, CO, July 24, 2008.

"Cognitive Wireless Communication in Time, Frequency and Space," McMaster University, July 20, 2007.

"Cognitive Wireless Communication in Time, Frequency and Space," WINLAB, Rutgers University, April 3, 2007.

"Cognitive Wireless Communication in Time, Frequency and Space," Columbia University, April 2, 2007.

"Cognitive Wireless Communication and Sensing in Time, Frequency and Space," Illinois Center for Wireless Systems, University of Illinois, February 23, 2007.

"Non-coherent Capacity and Reliability of Sparse Multipath Channels in the Wideband Regime," *2nd Workshop on Information Theory and Applications*, UCSD, January 2007.

"Active Wireless Sensing in Time, Frequency and Space," *Workshop on Mathematical Challenges and Opportunities in Sensor Networks*, Institute for Pure and Applied Mathematics, Los Angeles, January 2007.

"Wireless Communications and Sensing in Time, Frequency and Space," Darmstadt University, Germany, July 5, 2006.

"Distributed Inference in Wireless Sensor Networks," University of Frankfurt, Germany, July 4, 2006.

"Distributed Inference in Wireless Sensor Networks," Department of Computer Science, LUMS, Pakistan, June 28, 2006.

"Active Wireless Sensing", 2006 IEEE Communication Theory Workshop, San Juan, May 24, 2006.

"Wireless Communication and Sensing in Time, Frequency and Space", UCLA, November 7, 2005.

"Active Wireless Sensing and Applications in RFID-Enabled Systems," MITRE Workshop on Netted Sensors, October 26, 2005.

"Wireless Communications and Sensing: A Physical Perspective," Qualcomm, April 28. 2005.

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"Multi-antenna Wireless Channels: New Results on Modeling, Optimal Signaling and Capacity," Northwestern University, November 24, 2004.

"Multi-antenna Wireless Communications, Sensor Networks, and RFID," 3M Visit, University of Wisconsin, September 29, 2004.

" Sensor Networks, Antenna Array Systems and RFID," RFID Industry Workgroup Meeting, UW E-Business Consortium, Madison, WI, August 14, 2004.

"Correlated MIMO Channels: Modeling, Capacity and Coding," Stanford University, December 5, 2003.

"A Statistical Signal Modeling Framework for Optimizing Sensor Networks," *IEEE Statistical Signal Processing Workshop*, St. Louis, MO, September 29, 2003.

"A Virtual Representation for Multi-Antenna Wireless Channels," EECS Department, University of California at Berkeley, April 23, 2003.

"A Virtual Representation for Multi-Antenna Wireless Channels," Program on Applied and Computational Mathematics Colloquium, Princeton University, February 10, 2003.

"A Virtual Representation for Time- and Frequency-Selective MIMO Channels," FTW, Vienna, Austria, November 15, 2002.

"A Virtual Representation for Time- and Frequency-Selective MIMO Channels," ETH, Zurich, Switzerland, November 13, 2002.

"Deconstructing Multi-Antenna Wireless Channels," University of Hawaii, October 29, 2002.

"Deconstructing Multi-Antenna Fading Channels," University of Rome "La Sapienza", July 11, 2002.

"Deconstructing Multi-Antenna Wireless Channels," Department of Electrical Engineering, University of Washington-Seattle, April 15, 2002.

"Multi-Antenna Wireless Channels Made Simple," Chaos and Complexity Seminar, Physics Department, University of Wisconsin-Madison, April 9, 2002.

"Deconstructing Multi-Antenna Wireless Channels," Distinguished Lecture Series, Electrical and Computer Engineering, Illinois Institute of Technology, February 15, 2002.

"Orthogonal Time-Frequency Signaling Over Doubly Dispersive Channels," Department of Electronic Engineering, Unviversity of York, England, January 21, 2002.

"Deconstructing MIMO Wireless Channels," Centre for Telecommunications, King's College, University of London, January 14, 2002.

"Modeling and Capacity of MIMO Fading Channels," Motorola Laboratories, Schaumburg, IL, December 17, 2001.

"Deconstructing Multi-Antenna Wireless Channels," Department of Electrical Engineering, University of Southern California, November 8, 2001.

"Deconstructing Multi-Antenna Wireless Channels," Department of Electrical Engineering, Stanford University, November 7, 2001.

"Deconstructing Space-Time Channels," Department of Electronic Engineering, University of York, August 20, 2001.

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"Deconstructing Space-Time Channels," Department of Electrical and Computer Engineering, Ohio State University, May 22, 2001.

"Canonical Space-Time Modes Based Receivers," Wireless Communications Group, Texas Instruments, Dallas, TX, February 7, 2001.

"Modeling and Capacity of Multi-Antenna Multipath Channels," Department of Electrical and Computer Engineering, George Washington University, December 7, 2000.

"Modeling and Capacity of Multi-Antenna Multipath Channels," Department of Electrical and Computer Engineering, University of Colorado, Boulder, November 16, 2000.

"Integrated Design of CDMA Transceivers Via Canonical Space-Time Modes," Mobile Communications Group, Eurecom Institute, Sophia Antipolis, France, June 19, 2000.

"WINSPAR's Approach to Signaling, Reception and Dynamic Resource Allocation," Advanced Systems Technology, Rockwell Collins, Cedar Rapids, IA, May 24, 2000.

"WINSPAR's Approach to Signaling, Reception and Dynamic Resource Allocation," Motorola Labs, Schaumburg, IL, April 28, 2000

"Integrated Design of CDMA Transceivers Via Canonical Space-Time Modes," Department of Electrical Engineering, Cornell University, March 13, 2000.

"Wireless Communication in Canonical Channel Modes," Wireless Communications Group, Texas Instruments, Dallas, TX, January 20, 2000.

"Signal Processing Using Wavelets and Time-Frequency Representations," Chaos and Complex Systems Seminar, Physics Department, University of Wisconsin, December 14, 1999.

"The Holy Grid of Wireless Communications," Systems Seminar, Department of Electrical and Computer Engineering, University of Wisconsin, December 1, 1999.

"Wireless Communication in Canonical Channel Modes," Department of Electrical Engineering and Computer Science, University of Illinois at Chicago, October 15, 1999.

"Canonical Space-Time Processing for Multiuser Wireless Communications," Wireless Communications Group, Texas Instruments, Dallas, TX, July 27, 1999.

"Canonical Space-Time Processing for Multiuser Wireless Communications," Nokia Research Laboratory, Irving, TX, July 26, 1999.

"An Integrated Framework for Space-Time Processing in Multisuer Wireless Communications," Digital Communications Research Department, Bell Laboratories, Holmdel, NJ, June 21, 1999.

"Signal Processing in Canonical Space-Time Coordinates for Multiuser Wireless Communications," Department of Electrical and Computer Engineering, University of Minnesota, April 23, 1999.

"Signal Processing in Canonical Spatio-Temporal Coordinates for Wireless Communications," Motorola Cellular Infrastructure Group, Arlington Heights, IL, March 5, 1999.

"Interference-Resistant Timing Acquisition Over Multipath Fading Channels," Department of Electrical and Computer Engineering, Rice University, June 5, 1998.

"Channel-Based Signal Processing in Mobile Wireless Communications," Department of Electrical Engineering, University of Carlos III, Madrid, Spain, February 9, 1998.

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"Joint Multipath-Doppler Diversity in Fast Fading Mobile Wireless Channels," Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign, November 24, 1997.

"Communication Over Multipath Fading Channels: A Time-Frequency Perspective," 8th International Conference on Personal, Indoor and Mobile Radio Communications, Helsinki, Finland, September 1, 1997.

"Optimal Detection Using Time-Frequency Representations and Wavelets," Faculty of Electrical Engineering, Ghulam Ishak Institute of Technology, Topi, Pakistan, January 10, 1997.

"Time-Frequency Representations and Optimum Detection," Department of Electrical and Computer Engineering, University of Wisconsin–Madison, December 2, 1996.

"Statistical Signal Processing Using Time-Frequency and Wavelets ," Department of Electrical Engineering and Computer Science, The University of Michigan, October 26, 1996.

"A Statistical Framework for Time-Frequency and Wavelet Analysis," Department of Electrical Engineering, The Michigan State University, October 24, 1996.

"A Statistical Framework for Time-Frequency and Wavelet Analysis," Department of Electrical and Computer Engineering, Rice University, October 22, 1996.

"Statistical Time-Frequency Analysis," Department of Electrical Engineering, The Ohio State University, June 3, 1996.

Research Funding at UW-Madison (1997-2021)

2017-20	NSF	NeTS: SHF: Medium: Integrated Design and Optimization of Scalable Millimeter-Wave Multi-beam MIMO Networks for Gigabit Mobile Access; PI: A. Sayeed, co-PI: P. Ramanathan, $1,189,378; Collaborative project with WSU (PI: D. Heo, and co-pI: S. Gupta); Wisconsin (lead) share: $660,900, WSU share: $528,478. **Substitute PI (starting 11.27.17): P. Ramanathan.**
2016-19	NSF	RCN: Millimeter-Wave Wireless Research: Hardware, Communication, Computation, and Networking ; PI: A. Sayeed, co-PI: X. Zhang; $300,000. **Substitute-PI (starting 11.27.17): P. Ramanathan**.
2016-19	NSF	II-New: A Beamspace Multiple Input Multiple Output (MIMO) Testbed for Centimeter-Wave and Millimeter-Wave Wireless; PI: A. Sayeed, co-PI: P. Ramanathan; $775,000. **Substitute PI (starting 11.27.17): P. Ramanathan.**
2015-17	WARF	Accelerator Program, CAP-MIMO Phase III Prototype Development, PI: A. Sayeed; $128,000
2015-17	NSF	EAGER: Proof-of-Concept of a New MIMO Transceiver for Addressing Beam Squint in Wideband High-Dimensional Arrays; PI: A. Sayeed; $200,000
2014-17	NSF	PFI-AIR: Beamspace MIMO Transceiver Prototype for Gigabit Mobile Wireless Access at Millimeter-Wave Frequencies; PI: A. Sayeed, co-PI: C. Navis (UW Business); $200,000
2012-16	NSF	EARS: Beamspace Communication Techniques and Architectures for Enabling Gigabit Mobile Wireless at Millimeter-wave Frequencies; PI: A. Sayeed, co-PI: N. Behdad; $500,000

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2013-15	DARPA	DARPA 100G Program - Electro-optic transceivers for Millimeter-Wave Wireless Links - subcontract from Battelle Memorial Institute; PI: A. Sayeed; $55,000
2010-19	WARF	Continuous Aperture Phased MIMO; PI: A. Sayeed. Wisconsin Alumni Research Foundation (WARF) *Accelerator Competition Grant for Technology Commercialization*; Phases I, II, and III; $212,000
2010-13	NSF	EAGER: A Novel Hybrid Analog-Digital Architecture for Optimum Agile Wireless Communications Using Discrete Lens Arrays; PI: A. Sayeed, co-PI: N. Behdad; $150,000
2009-11	UW	Cognition and Adaptation in Wireless Networks; $35,000
2006-10	NSF	An Integrated PHY-MAC Approach for Secure Open-Access Wireless Networks; co-PI with S. Banerjee (Wisconsin) and A. Perrig (Carnegie Mellon); $330,000
2004-08	NSF	Communication over Dispersive Wireless Channels: Theory and Methods Based on Physical Principles; PI, joint with V. Veeravalli (Illinois); $500,000
2001-05	NSF (ITR)	Integrated Signal Processing and Antenna Array Design for Diversity Wireless Links; PI, joint with Z. Popovic (Colorado); $500,000
2001-04	ONR (YIP)	Maximal Exploitation of Space-Time Dimensions for Communication in Highly Dynamic Scenarios; PI; $300,000
2001-02	NSF	Measurement Based Channel Modeling for Coherent Terahertz Communications; co-PI, joint with D. van der Weide and B. Van Veen; $64,000
2000-03	DARPA	Location-Centric Distributed Computation and Signal Processing in Microsensor Networks; co-PI, joint with P. Ramanathan, Y. Hu, K. Saluja; $1,300,000
1999-03	NSF	Integrating Antennas, Receivers, and Networks in Mobile Wireless Communications; co-PI, joint with B. Van Veen, R. Agrawal, S. Hagness, D. van der Weide, L. Scharf (Colorado), Z. Popovic (Colorado); $750,000
1999-04	NSF (CAREER)	An Integrated Digital Signal Processing Framework for Optimized Wireless Communications; PI; $200,000
2000-01	Wisconsin	Signaling in Canonical Channel Modes for Wireless Networks; $25,000
1999-00	Wisconsin	Canonical Space-Time Processing in Wireless Communications; $20,000
1998-99	Wisconsin	New Techniques for Multiuser Wireless Communications; $20,000

Courses Taught and Developed at UW-Madison (1997-2021)

ECE 436	Analog Communication Systems
ECE 437	Digital Communication Systems
ECE 736	Wireless Communications
ECE 330	Signals and Systems
ECE 331	Probability and Statistics
ECE 732	Advanced Digital Signal Processing
ECE 737	Wavelets and Filter Banks

Former Students, Postdocs and Visiting Scholars at UW-Madison (1997-2021)

Kevin Zhu (M.S.), May 2018

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Chris Hall (M.S.), December 2017

Xinyu Gao, visiting Ph.D. student scholar, Tsinghua University, Mar. 2017-Sep. 2017

Xudian Hu (undergraduate researcher, August 2017)

Anuj Gadiyar (M.S.), May 2017

John Brady (Ph.D.), Spring 2017

Viet Vo (undergraduate research scholar), Fall 2016- Spring 2017

Omar Alqahtani (undergraduate research scholar), Fall 2016- Spring 17

Diana Kraemer (undergraduate), Fall 2016

Ayush Gupta (M.S), Fall 2016

Xianglu Li (visiting scholar), Assistant Researcher & Group Leader, Institute of Electronic Engineering, Chinese Academy of Engineering Physics, Sep. 2016-Jan. 2017

Usman Tayyab (visiting scholar), October 2015-July 2016

Peng Cheng (undergraduate), Spring 2016

Sabareesh Ganapath (M.S.), Spring 2016

John Hogan (M.S.), May 2016

Yifan Zhu (undergraduate), Fall 2015

Wasim Sheikh (M.S.), 2015

Alex Watras (M.S.), 2015

Sai Cheemalamarry (M.S.), 2015

Sida Li (Undergraduate researcher, Summer 2015)

Justin Cummings (M.S., 2015)

Kishore Kumar (graduate independent study, Fall 2014)

David Virgilio (undergraduate assistant, June 2013-November 2014)

Hua Deng (M.S, 2014)

Paul Thomas (M.S., 2014)

John Lima (M.S, 2014)

Gi Hong Song (M.S., 2012)

Matt Malloy (Ph.D.,2012); Amazon

Yanpei Liu (M.S., 2011); PhD student, UW-Madison

Tzu-Han Chou (Ph.D., 2011); Qualcomm, San Diego

Eunmo Kang (Ph.D., 2010); Qualcomm, San Diego

Waheed Bajwa (Ph.D., 2009) Professor, Rutgers University

Dr. Michail Matthaiou (visiting scholar, summer 2009), Technical University of Munich, currently Professor at Queen's University, Belfast

Steven Quick (M.S., 2008); Accenture

Gautham Hariharan (Ph.D. 2007); Qualcomm, San Diego

Prof. Chang-Heon Oh (visiting scholar, 2006-2007), Korea University of Technology and Education

V. Raghavan (Ph.D., 2006); Qualcomm, NJ

Z. Yan (Ph.D., 2006); Qualcomm, San Diego

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K. Liu (Ph.D., 2004); Qualcomm, San Diego

J. Kotecha (postdoc, 2002-2004); Senior Member of Tech. Staff, Freescale, Austin, TX

A. D'Costa (M.S., 2004); Qualcomm, San Diego, CA

V. Ramachandran (M.S., 2004); Google, CA

Z. Hong (postdoc, 2002-03); Canadian Research Centre, Ottawa, CA

J. Zhang (Ph.D., 2002); Senior Vice President of Research, Samsung, Dallas, TX

T. Deckert (M.S., 2002)

K. Carvalho (M.S., 2002); GE Medical Systems, Milwaukee, WI

K. Wong (M.S. 2001)

K. Tantinarawat (M.S., 2001)

T. Kadous (Ph.D., 2001); Vice President of Wireless, XCOM-Labs, San Diego, CA

A. Ganesan (M.S., 2000)

E. Onggosanusi (Ph.D., 2000); Samsung, Dallas, TX

M.-A. Baissas (M.S., 1999); Gates Foundation

J.-P. Gallaire (M.S., 1998); France Telecom

S. Bhashyam (M.S., 1997); Associate Prof., IIT Madras, India

University Service at UW-Madison (1997-2021)

1997-2017	Director, Wireless Communication and Sensing Laboratory
1998-2017	ECE Openhouse
1999-2017	Faculty Recruitment (Systems Area)
2016-2017	ECE Graduate Advisor
2016-2017	ECE Graduate Admissions and Fellowship Committee
2016-2017	ECE Steering Committee
2016-2017	CoE Academic Planning Council
2015-2016	ECE Steering Committee
2015-2016	CoE Academic Planning Council
2015-2016	ECE Graduate Advising (chair)
2014-2015	College of Engineering Equity and Diversity Committee
2014-2015	College of Engineering Academic Planning Council
2014-2015	ECE Graduate Committee (Chair)
2014-2015	ECE Educational Innovation Committee (Online Program in Wireless)
2005-2014	Associate Director, UW Wireless and Sensor Networks (WiSeNet) Consortium
2013-2014	College of Engineering Equity and Diversity Committee
2013-2014	Educational Innovation Committee (Chair)
2013-2014	Strategic Planning Committee
2013-2014	Workload Committee
2012-2013	Faculty Performance Review
2012-2013	Online Education Committee (Chair)
2012-2013	Faculty Recruitment Committee (Communications and Signal Processing)

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2010-2011	Faculty Recruitment (Power Systems)
2009-2011	Curriculum and Strategic Planning Committee
2010-2011	Awards Committee
2006-2011	Representative to College Equity and Diversity Committee
2006-2009	Undergraduate Advising
2007-2008	Graduate Admissions and Fellowships
2005-2006	Graduate Admissions and Fellowships
2005-2006	Faculty Performance Review
2003-2004	Eta Kappa Nu Faculty Advisor
2000-2004	Graduate Fellowships
2000-2001	Departmental Seminar Coordinator
1997-1998	Graduate Fellowships
1999-2004	IEEE Student Branch Faculty Advisor

Personal

U.S. Citizen. Married with one child.

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