R. Michael Buehrer, FIEEE

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Education

June 1996	Virginia Polytechnic Institute and State University, The Bradley Department of Electrical and Computer Engineering, Bradley Fellowship, Ph.D.
August 1993	The University of Toledo, Department of Electrical Engineering and Computer Science, M.S.
June 1991	The University of Toledo, Department of Electrical Engineering and Computer Science, B.S.

Employment

Aug. 2012 - Present	Professor, Virginia Polytechnic Institute and State University, Bradley Department of Electrical and Computer Engineering, Director of *Wireless @ Virginia Tech*
Aug. 2006 – Aug. 2012	Associate Professor, Virginia Polytechnic Institute and State University, Bradley Department of Electrical and Computer Engineering, Mobile and Portable Radio Research Group.
Aug. 2009 – Dec. 2009	Visiting Researcher at the Laboratory for Telecommunication Sciences (LTS) a federal research lab which focuses on telecommunication challenges for national defense.
Aug. 2001 – Aug. 2006	Assistant Professor, Virginia Polytechnic Institute and State University, Bradley Department of Electrical and Computer Engineering, Mobile and Portable Radio Research Group.
Aug. 2001 – Present	Independent Consultant, self-employed.
Aug. 1996 – Aug. 2001	Member Technical Staff, Bell Laboratories, Lucent Technologies, promoted to Distinguished Member of Technical Staff in September 2000.
Sep. 1993 – Jun. 1996	Graduate Research Assistant, Virginia Polytechnic Institute and State University, Bradley Department of Electrical and Computer Engineering, Mobile and Portable Radio Research Group.
May 1994 – Aug. 1994	Senior Engineer, Stanford Telecommunications, Advanced Programs.
Sep. 1991 – Aug. 1993	Graduate Research Assistant, The University of Toledo, Department of Electrical Engineering and Computer Science, Communications Research Group.

Honors and Recognitions

- Fellow of the IEEE (So named "for contributions to wideband signal processing in communications and geolocation")
- 2023 MILCOM Lifetime Award for Technical Achievement
  - For Outstanding, Sustained Technical Contributions to Military Communications
- NSC Vanu Bose Best Paper Award *IEEE Military Communications Conference (MILCOM)* 2023.
- 2023 Fred W. Ellersick Award for the Best Paper in the Unclassified Technical Program, *IEEE Military Communications Conference (MILCOM)*, 2023
- NSC Vanu Bose Best Paper Award *IEEE Military Communications Conference (MILCOM)* 2021.
- Dean's Award for Teaching Excellence - April 2014.
- 2010 Fred W. Ellersick Award for the Best Paper in the Unclassified Technical Program, *IEEE Military Communications Conference (MILCOM)* 2010.
- SDR Forum Best Paper Award, 2007.
- Outstanding Paper Award, SDR Forum, 2008.
- Dean's Award for Outstanding New Assistant Professor, College of Engineering, 2003.
- Dean's List for Teaching Effectiveness (teaching evaluation greater than 3.6) 16 out of 18 semesters list was published.
- Nominated for Certificate of Teaching Excellence (CTE), College of Engineering, Spring 2004 and Spring 2005.
  - Served as a member of the College of Engineering CTE committee from 2006 through 2021.
- Bell Labs President's Silver Award for outstanding research contributions.
- 1999 Best Paper Award for *Bell Labs Technical Journal.*

Patents

- S. D. Gordon, R.M. Vaghefi, and R.M. Buehrer, "Estimating the Location of a Wireless Terminal Based on Cooperative Measurements," *US Patent No. 10,527,708* , January 7, 2020.
- S. D. Gordon, R.M. Vaghefi, and R.M. Buehrer, "Estimating the Location of a Wireless Terminal Based on Radio-Frequency Pattern Matching and Cooperative Measurements," *US Patent No. 9,989,620 B1*, June 5, 2018.
- S. D. Gordon, R.M. Vaghefi, and R.M. Buehrer, "Estimating the Location of a Wireless Terminal Based on Radio-Frequency Pattern Matching and Cooperative Measurements," *US Patent No. 9,596,571 B1*, March 14, 2017.
- R.M. Buehrer, R.A. Soni, and J.A. Tsai, "Methods and Apparatus for Downlink Diversity in CDMA Using Walsh Codes," *U.S. Patent No. 7,400,614 B2*, July 15, 2008.
- R. D. Benning, R. M. Buehrer, Mark H Kramlm, and P. A. Polakos, " Space-Time Spreading and Phase Sweep Transmit Diversity", *US Patent No. 7,042,955 B2*, May 9, 2006.
- R.D. Benning, R.M. Buehrer, and R.A. Soni, " Biased Phase Sweep Transmit Diversity", *US Patent No. 7,035,599 B2*, April 25, 2006.

- R. D. Benning, R. M. Buehrer, P. A. Polakos, and R. A. Soni, "Split Shift Phase Sweep Transmit Diversity, " *US Patent No. 6,980,778 B2*, December 27, 2005.
- R.D. Benning, R.M. Buehrer, and R.A. Soni, " Symmetric Sweep Phase Sweep Transmit Diversity", *US Patent No. 6,920,314*, July 19, 2005.
- R.M. Buehrer, S.P. Nicoloso, R.A. Soni, and D. Uptegrove, "Cellular Communications System And Related Methods", *US Patent No. 6,801,791*, October 5, 2004.
- R.M. Buehrer, S.-C. Liu, S.P. Nicoloso, and D. Uptegrove, "Method of channel estimation and compensation based thereon," *U.S. Patent No. 6,542,560*, April 1, 2003.
- R.M. Buehrer and S.-C. Liu, "Code division multiple access system and method of operation with improved signal acquisition and processing," *U.S. Patent No. 6,549,565*, April 15, 2003.
- R.D. Benning, R.M. Buehrer, and R.A. Soni, "Apparatus and method of enhancing transmit diversity," U.*S. Patent No. 6,594,226*, July 15, 2003.
- R.M. Buehrer, S.-C. Liu, S.P. Nicoloso, and D. Uptegrove, "Iterative channel estimation and compensation based thereon," *U.S. Patent No. 6,614,857*, September 2, 2003.
- R.M. Buehrer and R.A. Soni, "Methods And Apparatus For Downlink Diversity In CDMA Using Walsh Codes", *U.S. Patent No. 6,515,978*, February 4, 2003.
- R.M. Buehrer, S. Gollamudi, and S.P. Nicoloso, "Multistage interference cancellation for CDMA applications using M-ary orthogonal modulation," *US Patent No. 6,363,103*, March 26, 2002.
- S.A. Allpress, R.M. Buehrer, and R.A. Soni, "Receiver Architecture Employing Space Time Spreading and Orthogonal Transmit Diversity Techniques," *US Patent No. 6,317,410 B1*, November 13, 2001.
- S.A. Allpress, R.M. Buehrer, Quinn Li, Ramesh Nallepilli, and R.A. Soni, "Transmitter Architecture Employing Space Time Spreading and Orthogonal Transmit Diversity Techniques," *US Patent No. 6,392,988*, May 21, 2001.
- R.M. Buehrer, M.D. Hahm, S.C. Liu, and S.P. Nicoloso, "Base Station System Including Parallel Interference Cancellation Processor," *US Patent No. 6,157,847*, December 5, 2000.

Teaching

Undergraduate Courses

- Engineering Exploration (ECE 1024)
- Electric Circuits (ECE 2004)
- Signals and Systems (ECE 2704, ECE 2714)
- Introduction to Communications (ECE 3614)
- Digital Communications (ECE 4634)
- Analog and Digital Communication Laboratory (ECE 4664)– *developed this course with $70k grant from the State of Virginia.*

Graduate Courses

- Spread Spectrum Communications (ECE 5660)– *developed this course for the ECE department. It is has been a permanent offering since 2003.*
- Advanced Digital Communications (ECE 5654)
- Multi-Channel Communications (Course covers the fundamentals of OFDM and MIMO techniques the underlying technologies for 4G cellular communications) – *Developed this course for the ECE dept. It is has been a permanent offering since 2008.*
- Information Theory (ECE 5634)
- Machine Learning for Communication Systems (ECE 5984)

Teaching Evaluations (Fall 2001 through Spring 2011)

- Average student evaluation – 3.8/4.0 (17 courses, 450 students)
- Dean's List (student evaluation $>$ 3.6) in 16 of 18 semesters of teaching

Teaching Evaluations (Fall 2011 through Spring 2023)

- Average student evaluation – 5.5/6.0 (25 courses, $>$ 700 students)

Short Courses Given

- Position Location
- Position Location using Ultra-Wideband Signals
- Radio Resource Management in CDMA Systems
- WiFi – An introduction to WLANs
- OFDM – Multicarrier transmission for high data rate systems; Application to 4G (LTE) cellular and Wi-Fi
- Ultra Wideband Communications
- Multi-Input Multi-Output (MIMO) Communication Systems; Application to 4G (LTE/LTE-Advanced) cellular and Wi-Fi

Advising

Current

- Don-Roberts Emenonye, " Machine Learning Approaches to Remote Rehabilitation," Ph.D. candidate, expected graduation December 2023.
- Sam Shebert, "Automatically Classifying Modern Communication Waveforms," Ph.D. candidate, expected graduation May 2024.
- Megan Moore, "Geolocation via LEO Networks," Ph.D. candidate, expected graduation May 2025.

- Haozhou Hu, "Geolocation via Landmarks," Ph.D. candidate, expected graduation May 2025.
- Gaurav Duggal, "Combined Radar and Communications Signals for Geolocation," Ph.D. candidate, expected graduation May 2025.
- Harish Dureppagari, "Emergency Localization using UAVs and Collaborative Localization," Ph.D. candidate, expected graduation May 2026.
- Kumar Sai Bondada, "Synchronization for Distributed MIMO," Ph.D. candidate, expected graduation May 2026.
- Xinrui Li, "Interference Mitigation in Radio Astronomy," Ph.D. candidate, expected graduation May 2026.
- Tom Anders, "Resource Allocation in Multi-static and Mono-static Radar Networks," M.S. candidate, expected graduation December 2024.
- Zach Schutz, "Machine Learning-based Signal Jamming," M.S. candidate, expected graduation May 2024.

Former

1. William H. Howard, "Distributed Learning for Cognitive Radar Networks," Ph.D. Novemer 2023.
2. Charlie Thornton, " On the Value of Online Learning for Cognitive Radar Waveform Selection," Ph.D., May 2023.
3. Jianyuan Yu, "Wireless Sensing and Fusion using Deep Neural Networks," Ph.D., August 2022.
4. Yue Xu, " Deep Recurrent Q Networks for Dynamic Spectrum Access in Dynamic Heterogeneous Environments with Partial Observations," Ph.D. , August 2022.
5. Chris O'Lone, "Statistical Analysis of Geolocation Fundamentals Using Stochastic Geometry," Ph.D. December 2020.
6. Jeff Poston, "ILoViT: Indoor Localization via Vibration Tracking," Ph.D. March 2018.
7. Mahi Abdelbar, "Applications of Sensor Fusion in Classification, Localization and Mapping," Ph.D. February 2018.
8. Mico Woolward, "SUPPLEMENTING LOCALIZATION ALGORITHMS FOR INDOOR FOOTSTEPS," Ph.D., July 2017.
9. Daniel Jakubisin, "Advances in Iterative Probabilistic Processing for Communication Receivers," Ph.D., April, 2016, *currently employed by The Hume Center*.
10. Jeannette Nounagnon "Using Kullback-Leibler Divergence to Analyze the Performance of Collaborative Positioning,", Ph.D., April, 2016, *currently employed by ComSat*.
11. SaiDhiraj Amuru, "Intelligent Approaches for Communication Denial," Ph.D., September, 2015, *currently employed by Samsung*.
12. Javier Schloemann, "Fundamental Analyses of Collaborative and Noncollaborative Positioning," Ph.D., August, 2015, *currently employed by Northrup-Grumman*.
13. Reza Vaghefi, "Cooperative Positioning in Wireless Sensor Networks Using Semidefinite Programming," Ph.D., December 2014, *currently employed by Blue Danube Labs*.
14. Jeong-heon Lee, "Physical Layer Security for Wireless Position Location in the Presence of Location Spoofing," Ph.D., March 2011, *currently employed by Samsung*.

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