

Allen B. MacKenzie

Curriculum Vitae

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Education

Ph.D. in Electrical and Computer Engineering, Cornell University, May 2003. Dissertation: *Game Theoretic Analysis of Power Control and Medium Access Control*. Advisor: Professor Steven B. Wicker.

B.Eng. in Electrical and Computer Engineering and Mathematics, Vanderbilt University, May 1999, *summa cum laude* and Founder's Medal.

Professional Experience

Professor, Bradley Department of Electrical and Computer Engineering, Virginia Tech, 2018–present.

Associate Professor, Bradley Department of Electrical and Computer Engineering, Virginia Tech, 2010–2018.

E.T.S. Walton Visiting Professor, CTVR / the telecommunications research centre, Trinity College Dublin, Ireland, 2012–2013.

Assistant Professor, Bradley Department of Electrical and Computer Engineering, Virginia Tech, 2003–2010.

Awards and Honors

Selected to participate in Virginia Tech's Academic Leaders Program, 2018.

E.T.S. Walton Visitor Award from the Science Foundation of Ireland to support a year-long sabbatical at Trinity College Dublin, 2012–2013.

Elevated to Senior Member, IEEE, 2008.

Dean's Award for Outstanding New Assistant Professor, College of Engineering, Virginia Tech, 2006.

Faculty Early Career Development (CAREER) Award, National Science Foundation, 2005.

Selected to attend National Effective Teaching Institute, American Society for Engineering Education, 2004.

Graduate Research Fellowship, National Science Foundation, 2000–2003.

Founder's Medal in Engineering, awarded to the top student in the College of Engineering, Vanderbilt University, 1999.

Research and Scholarship Highlights

An active and influential researcher with more than 100 journal, refereed conference, and book chapter publications, many of which are highly cited, yielding an h-index of 28.¹

Participated in \$7.5M in sponsored research projects with personal responsibility of \$2.7M.

One of the first researchers to describe a “cognitive network.” The two papers first describing this concept, a conference paper in IEEE DySPAN 2005 and a magazine article in *IEEE Communications Magazine* in 2006, have now been cited 705 and 532 times, respectively.

A pioneering researcher in using game theory to analyze wireless networks, with a short tutorial monograph, *Game Theory for Wireless Engineers*, that has been cited 489 times and four articles on the subject that have been cited more than 270 times each (from *IEEE Communications Surveys and Tutorials*, 2005; *IEEE Inform*, 2003; *IEEE Communications Magazine*, 2001; and *IEEE Globecom*, 2001).

¹All citation counts and reference statistics are taken from Google Scholar; last updated 2018-08-01.

An innovative researcher that works with experimental networks, including a unique project that created and ran a competition in ad hoc networking (the MANIAC Challenge, see *IEEE Communications Magazine* paper from 2012), a project that has created open source networking software for the research community (the FINS Framework, see *IEEE Transactions on Mobile Computing* paper from 2016), and work on moving carrier sensing functions to the FPGA in a SDR (see *IEEE Transactions on Computers* paper from 2015).

Teaching Highlights

A versatile teacher that has taught a variety of subjects (including courses on probability and random processes, programming, communications theory, and networking) at a variety of levels (from second-year undergraduate signals and systems and programming courses to many graduate courses).

An innovative teacher that organized international graduate courses on millimeter wave communications and networking and dynamic spectrum access networks, including students from Virginia Tech, Trinity College Dublin, and Queen's University Belfast and attracted guest speakers from around the world.

A contributor to continuing education by giving tutorials at conferences and symposia and by leading short courses for researchers at Trinity College Dublin and the University of Oulu (Finland). Most recently, presented a half-day tutorial titled "Resource Allocation in Wireless Networks under Uncertainties: A Stochastic Optimization Framework" at the IEEE International Conference on Communications (ICC), 2017.

Service Highlights

A member of the Commerce Spectrum Management Advisory Committee of the United States Department of Commerce, serving a two year term from 2016–2018. This committee advises the Assistant Secretary of Commerce for Communications and Information on major spectrum policy issues for the benefit of the American people.

An experienced campus leader who has served as Area Chair of the ECE Communications Area for many years (planning the course timetable and making teaching recommendations), is serving as Associate Director of Wireless @ Virginia Tech, a major research center, and is serving as Associate Faculty Principal for the Residential College at West Ambler Johnston.

An active contributor to the research community, currently serving as an Area Editor for *IEEE Transactions on Communications* (after a two-year term as Associate Editor) and an Associate Editor for *IEEE Transactions on Cognitive Communications and Networking*. Previously served as an Associate Editor for *IEEE Transactions on Mobile Computing* (2011–2016) and a guest editor for a special topic in *IEEE Communications Magazine* in 2011.

Also involved in conference organization, currently serving as Workshop Co-Chair for the *IEEE International Conference on Communications*, 2020, and having previously served as the Tutorials Co-Chair for *IEEE DySPAN* 2014, the Dynamic Spectrum Management Track Chair for Crowncom 2014, and the Poster and Travel Grants Chair for *IEEE DySPAN* (2011), in addition to serving as a technical program committee member for many conferences.

Publications

Books

1. W. H. Tranter and A. B. MacKenzie, *A Tutorial on Queueing and Trunking with Applications to Communications*. Morgan and Claypool, 2012.
2. A. B. MacKenzie and L. A. DaSilva, *Game Theory for Wireless Engineers*. Morgan and Claypool, 2006.

Book Chapters

1. J. Neel, J. H. Reed, and A. B. MacKenzie, "Cognitive radio network analysis," in *Cognitive Radio Technology*, 2nd ed., B. Fette, Ed. Elsevier, 2009, ch. 15, pp. 483–533.
2. R. W. Thomas, D. H. Friend, L. A. DaSilva, and A. B. MacKenzie, "Cognitive networks," in *Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems*, H. Arslan, Ed. Dordrecht, The Netherlands: Springer, 2007, pp. 17–41.
3. D. H. Friend, R. W. Thomas, A. B. MacKenzie, and L. A. DaSilva, "Distributed learning and reasoning in cognitive networks," in *Cognitive Networks: Towards Self-Aware Networks*, Q. Mahmoud, Ed. Wiley, 2007.
4. J. Neel, J. H. Reed, and A. B. MacKenzie, "Cognitive radio network analysis," in *Cognitive Radio Technology*, B. Fette, Ed. Elsevier, 2006, ch. 15, pp. 501–579.

Journal & Magazine Articles

1. A. E. Hilal and A. B. MacKenzie, "A distributed coalition game model for cooperation in MANETs," *Ad Hoc Networks*, vol. 85, pp. 46–59, March 2019.
2. A. Nabil, A. V. Padaki, M. J. Abdel-Rahman, M. E. Nainay, A. B. MacKenzie, and J. H. Reed, "On optimal resource allocation in multi-RAT wireless networks with receiver characteristic awareness," 2018, to appear in *IEEE Transactions on Cognitive Communications and Networking*.
3. E. Mazied, M. Y. ElNainay, M. J. Abdel-Rahman, S. F. Midkiff, H. Rakha, M. Rizk, and A. B. MacKenzie, "The wireless control plane: An overview and directions for future research," 2018, to appear in *Journal of Network and Computer Applications*.
4. W. Afifi, M. J. Abdel-Rahman, M. Krunz, and A. B. MacKenzie, "Full-duplex or half-duplex: A bayesian game for wireless networks with heterogeneous self-interference cancellation capabilities," *IEEE Transactions on Mobile Computing*, vol. 17, no. 5, pp. 1076–1089, May 2018.
5. S. Chatterjee, M. J. Abdel-Rahman, and A. B. MacKenzie, "Optimal base station deployment with downlink rate coverage probability constraint," *IEEE Wireless Communications Letters*, vol. 7, no. 3, pp. 340–343, June 2018.
6. Z. Khan, J. Lehtomäki, A. V. Vasilakos, A. B. MacKenzie, and M. Juntti, "Adaptive wireless communications under competition and jamming in energy constrained networks," *Wireless Networks*, vol. 24, no. 1, pp. 151–171, 2018.
7. Y. E. Sagduyu, Y. Shi, A. B. MacKenzie, and Y. T. Hou, "Regret minimization for primary/secondary access to satellite resources with cognitive interference," *IEEE Transactions on Wireless Communications*, vol. 17, no. 5, pp. 3512–3523, May 2018.
8. A. S. Shahfigh, B. Lorenzo, S. Glisic, J. Pérez-Romero, L. A. DaSilva, A. B. MacKenzie, and J. Röning, "A framework for dynamic network architecture and topology optimization," *IEEE/ACM Transactions on Networking*, vol. 24, no. 2, pp. 717–730, 2016.
9. J. Reed, A. Abdallah, A. B. MacKenzie, L. A. DaSilva, and M. S. Thompson, "The FINS framework: Design and implementation of the flexible internetwork stack (FINS) framework," *IEEE Transactions on Mobile Computing*, vol. 15, no. 2, pp. 489–502, 2016.
10. H. Ahmadi, A. Farhang, N. Marchetti, and A. B. MacKenzie, "A game theoretic approach for pilot contamination avoidance in massive MIMO," *IEEE Wireless Communications Letters*, vol. 5, no. 1, pp. 12–15, February 2016.

11. P. D. Francesco, S. McGettrick, U. K. Anyanwu, J. C. O'Sullivan, A. B. MacKenzie, and L. A. DaSilva, "A split MAC approach for SDR platforms," *IEEE Transactions on Computers*, vol. 64, no. 4, pp. 912–924, April 2015.
12. M. S. Thompson, A. S. Abdallah, J. M. Reed, A. B. MacKenzie, and L. A. DaSilva, "The FINS framework: An open-source, userspace networking subsystem for linux," *IEEE Network*, vol. 28, no. 5, pp. 32–37, September–October 2014.
13. X. Chen, H. Zhang, A. B. MacKenzie, and M. Matinmikko, "Predicting spectrum occupancies using a non-stationary hidden markov model," *IEEE Wireless Communications Letters*, vol. 3, no. 4, pp. 333–336, August 2014.
14. M. W. Baidas and A. B. MacKenzie, "Many-to-many space-time network coding for amplify-and-forward cooperative networks: Node selection and performance analysis," *EURASIP Journal on Wireless Communications and Networking*, vol. 2014, no. 48, March 2014.
15. —, "Altruistic coalition formation in cooperative wireless networks," *IEEE Transactions on Communications*, vol. 61, no. 11, pp. 4678–4689, November 2013.
16. M. Baidas, A. B. MacKenzie, and R. M. Buehrer, "Network-coded bi-directional relaying for amplify-and-forward cooperative networks: A comparative study," *IEEE Transactions on Wireless Communications*, vol. 12, no. 7, pp. 3238–3252, July 2013.
17. R. E. Irwin, A. B. MacKenzie, and L. A. DaSilva, "Resource-minimized channel assignment for multi-transceiver cognitive radio networks," *IEEE Journal on Selected Areas in Communications*, vol. 31, no. 3, pp. 442–450, March 2013.
18. A. B. MacKenzie and L. A. DaSilva, "Application of signal processing to addressing wireless data demand [in the spotlight]," *IEEE Signal Processing Magazine*, vol. 29, no. 6, pp. 168, 163–166, November 2012.
19. M. W. Baidas and A. B. MacKenzie, "An auction mechanism for power allocation in multi-source, multi-relay cooperative wireless networks," *IEEE Transactions on Wireless Communications*, vol. 11, no. 9, pp. 3250–3260, September 2012.
20. M. S. Thompson, A. B. MacKenzie, L. A. DaSilva, and G. Hadjichristofi, "A mobile ad hoc networking competition: A retrospective look at the MANIAC challenge," *IEEE Communications Magazine*, vol. 50, no. 7, pp. 121–127, July 2012.
21. J. Deaton, S. Ahmad, U. Shukla, R. Irwin, L. DaSilva, and A. MacKenzie, "Evaluation of dynamic channel and power assignment for cognitive networks," *Wireless Personal Communications*, vol. 57, no. 1, pp. 5–18, 2011.
22. R. S. Komali, R. W. Thomas, L. A. DaSilva, and A. B. MacKenzie, "The price of ignorance: Distributed topology control in cognitive networks," *IEEE Transactions on Wireless Communications*, vol. 9, no. 4, pp. 1434–1445, 2010.
23. J. Suris, L. Dasilva, Z. Han, A. MacKenzie, and R. Komali, "Asymptotic optimality for distributed spectrum sharing using bargaining solutions," *IEEE Transactions on Wireless Communications*, vol. 8, no. 10, pp. 5225–5237, October 2009.
24. R. Menon, R. M. Buehrer, A. B. MacKenzie, and J. H. Reed, "Interference avoidance in networks with distributed receivers," *IEEE Transactions on Communications*, vol. 57, no. 10, pp. 3078–3091, October 2009.
25. A. B. MacKenzie, J. H. Reed, P. Athanas, C. W. Bostian, R. M. Buehrer, L. A. DaSilva, S. W. Ellingson, Y. T. Hou, M. Hsiao, J.-M. Park, C. Patterson, S. Raman, and C. R. C. M. da Silva, "Cognitive radio and networking research at virginia tech," *Proc. of the IEEE*, vol. 97, no. 4, pp. 660–688, April 2009.

26. R. Menon, A. B. MacKenzie, J. E. Hicks, R. M. Buehrer, and J. H. Reed, "A game-theoretic framework for interference avoidance," *IEEE Transactions on Communications*, vol. 57, no. 4, pp. 1087–1098, April 2009.
27. S. V. Ginde, A. B. MacKenzie, R. M. Buehrer, and R. S. Komali, "A game-theoretic analysis of link adaptation in cellular radio networks," *IEEE Transactions on Vehicular Technology*, vol. 57, no. 5, pp. 3108–3120, September 2008.
28. R. S. Komali, A. B. MacKenzie, and R. P. Gilles, "Effect of selfish node behavior on efficient topology design," *IEEE Transactions on Mobile Computing*, vol. 7, no. 9, pp. 1057–1070, September 2008.
29. R. W. Thomas, D. H. Friend, L. A. DaSilva, and A. B. MacKenzie, "Cognitive networks: Adaptation and learning to achieve end-to-end performance objectives," *IEEE Communications Magazine*, pp. 51–57, December 2006.
30. V. Srivastava, J. Neel, A. B. MacKenzie, R. Menon, L. A. DaSilva, J. E. Hicks, J. H. Reed, and R. P. Gilles, "Using game theory to analyze wireless ad hoc networks," *IEEE Communications Surveys and Tutorials*, vol. 7, no. 4, pp. 46–56, 2005.
31. A. B. MacKenzie and S. B. Wicker, "Game theory and the design of self-configuring, adaptive wireless networks," *IEEE Communications Magazine*, vol. 39, no. 11, pp. 126–131, Nov. 2001.

Peer Reviewed Conference Papers

1. K. Teague, M. J. Abdel-Rahman, and A. B. MacKenzie, "Joint base station selection and adaptive slicing in virtualized wireless networks: A stochastic optimization framework," in *Proc. of the International Conference on Computing, Networking and Communications (ICNC)*, January 2019.
2. S. Chatterjee, M. J. Abdel-Rahman, and A. B. MacKenzie, "Virtualization framework for cellular networks with downlink rate coverage probability constraints," to appear in *IEEE Global Telecommunications Conference (GlobeCom)*, 2018.
3. K. V. Cardoso, M. J. Abdel-Rahman, A. B. MacKenzie, and L. A. DaSilva, "Virtualization and programmability in mobile wireless networks: Architecture and resource management," in *Proc. of the International Workshop on Mobile Edge Communications*, 2017.
4. M. J. Abdel-Rahman, E. Mazied, K. Teague, A. B. MacKenzie, and S. Midkiff, "Robust controller placement and assignment in software-defined cellular networks," in *Proc. of the International Conference on Computer Communications and Networks (ICCCN)*, 2017.
5. S. Chatterjee, M. J. Abdel-Rahman, and A. B. MacKenzie, "Optimal distributed allocation of almost blank subframes for LTE/WiFi coexistence," in *Proc. of the International Workshop on Resource Allocation, Cooperation, and Competition in Wireless Networks (RAWNET)*, 2017.
6. M. N. Soorki, M. J. Abdel-Rahman, A. B. MacKenzie, and W. Saad, "Joint access point deployment and assignment in mmwave networks with stochastic user orientation," in *Proc. of the International Workshop on Resource Allocation, Cooperation, and Competition in Wireless Networks (RAWNET)*, May 2017.
7. M. N. Soorki, A. B. MacKenzie, and W. Saad, "Millimeter wave network coverage with stochastic user orientation," in *Proc. of the IEEE Annual International Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC)*, 2017.
8. M. J. Abdel-Rahman, E. Mazied, A. B. MacKenzie, S. F. Midkiff, M. Rizk, and M. Y. ElNainay, "On stochastic controller placement in software-defined wireless networks," in *Proc. of the IEEE Wireless Communications and Networking Conference*, 2017.

9. W. Afifi, M. J. Abdel-Rahman, M. Krunz, and A. B. MacKenzie, "Coexistence in wireless networks with heterogeneous self-interference cancellation capability," in *Proc. International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt)*, 2016.
10. M. J. Abdel-Rahman, M. AbdelRaheem, A. B. MacKenzie, K. Cardoso, and M. Krunz, "On the orchestration of robust virtual LTE-U networks from hybrid half/full-duplex Wi-Fi APs," in *Proc. IEEE Wireless Communications and Networking Conference (WCNC)*, 2016.
11. A. S. Abdallah, A. B. MacKenzie, V. Marojevic, R. B. Bacchus, A. Riaz, D. Roberson, J. Kalliovaara, J. Hallio, and R. Ekman, "Detecting the impact of human mega-events on spectrum usage," in *Proc. IEEE Consumer Communications and Networking Conference (CCNC)*, January 2016.
12. M. J. Abdel-Rahman, K. V. Cardoso, A. B. MacKenzie, and L. A. DaSilva, "Dimensioning virtualized wireless access networks from a common pool of resources," in *Proc. IEEE Consumer Communications and Networking Conference (CCNC)*, 2016.
13. Y. E. Sagduyu, Y. Shi, A. B. MacKenzie, and T. Hou, "Regret minimization-based robust game theoretic solution for dynamic spectrum access," in *Proc. IEEE Consumer Communications and Networking Conference (CCNC)*, January 2016.
14. M. J. Abdel-Rahman, M. AbdelRaheem, and A. B. MacKenzie, "Stochastic resource allocation in opportunistic LTE-A networks with heterogeneous self-interference cancellation capabilities," in *Proc. IEEE Symposium on New Frontiers in Dynamic Spectrum Access Networks (DySPAN)*, 2015.
15. A. S. Abdallah and A. B. MacKenzie, "A cross-layer controller for adaptive video streaming over IEEE 802.11 networks," in *Proc. IEEE International Conference on Communications (ICC)*, June 2015.
16. V. K. Sastry, A. B. MacKenzie, L. A. DaSilva, B. Lorenzo, and S. Glisic, "Data offloading for multi-hop cellular networks," in *Proc. IEEE Annual Symposium on Personal, Indoor, and Mobile Radio Communication (PIMRC)*, Washington, DC, 2014.
17. T. Taher, R. Attard, A. Riaz, D. Roberson, J. Taylor, K. Zdunek, J. Hallio, R. Ekman, J. Paavola, J. Suutala, J. Rönning, M. Matinmikko, M. Höyhty, and A. B. MacKenzie, "Global spectrum observatory network setup and initial findings," in *Proc. of the International Conference on Cognitive Radio Oriented Wireless Networks (CROWNCOM)*, June 2014.
18. C. W. Patterson, A. B. MacKenzie, S. Glisic, B. Lorenzo, J. Rönning, and L. A. DaSilva, "An economic model of data offloading between mobile network operators and WLAN operators," in *Proc. of the International Symposium on Modeling and Optimization in Mobile, Ad Hoc, and Wireless Networks (WiOpt)*, May 2014.
19. P. D. Francesco, S. McGettrick, U. K. Anyanwu, J. C. O'Sullivan, A. B. MacKenzie, and L. A. DaSilva, "A split architecture for random access MAC for SDR platforms," in *Proc. of the International Conference on Cognitive Radio Oriented Wireless Networks (CrownCom)*, Washington, DC, July 2012.
20. R. E. Irwin, A. B. MacKenzie, and L. A. DaSilva, "Traffic-aware channel assignment for multi-radio wireless networks," in *Proc. of the International IFIP TC 6 Networking Conference (NETWORKING)*, Prague, May 2012, pp. 331–342.
21. M. Baidas, A. B. MacKenzie, and R. M. Buehrer, "Performance analysis of network-coded bi-directional relaying for amplify-and-forward cooperative wireless networks," in *Proc. of the IEEE International Wireless Communications and Mobile Computing Conference (IWCMC)*, Limassol, August 2012, pp. 222–227.
22. A. E. Hilal and A. B. MacKenzie, "Mitigating the effect of mobility on cooperation in wireless ad hoc networks," in *Proc. IEEE International Conference on Wireless and Mobile Computing, Networking, and Communications (WiMob)*, Barcelona, October 2012, pp. 365–372.

23. M. W. Baidas and A. B. MacKenzie, "On the impact of power allocation on coalition formation in cooperative wireless networks," in *Proc. IEEE International Conference on Wireless and Mobile Computing, Networking, and Communications (WiMob)*, October 2012, pp. 488–495.
24. M. Baidas and A. B. MacKenzie, "Auction-based power allocation for multi-source multi-relay cooperative wireless networks," in *Proc. IEEE Global Telecommunications Conference (GLOBECOM)*, December 2011.
25. R. E. Irwin, A. B. MacKenzie, and L. A. DaSilva, "Resource-minimized channel assignment for multi-transceiver wireless networks," in *Proc. IEEE Global Telecommunications Conference (GLOBECOM)*, December 2011.
26. Y. Shi and A. B. MacKenzie, "Distributed algorithms for resource allocation in cellular networks with coexisting femto- and macrocells," in *Proc. IEEE Global Telecommunications Conference (GLOBECOM)*, December 2011.
27. M. S. Thompson, A. B. MacKenzie, and L. A. DaSilva, "A method of proactive MANET routing protocol evaluation applied to OLSR protocol," in *Proc. ACM Workshop on Wireless Network Testbeds, Experimental Evaluation, and Characterization (WiNTECH)*, September 2011.
28. A. S. Abdallah, M. D. Horvath, M. S. Thompson, A. B. MacKenzie, and L. A. DaSilva, "Poster abstract: Facilitating experimental networking research with the fins framework," in *Proc. ACM Workshop on Wireless Network Testbeds, Experimental Evaluation, and Characterization (WiNTECH)*, September 2011.
29. M. W. Baidas and A. B. MacKenzie, "Auction-based power allocation for many-to-one cooperative wireless networks," in *Proc. IEEE International Wireless Communications and Mobile Computing Conference (IWCMC)*, July 2011.
30. A. S. Abdallah, A. B. MacKenzie, L. A. DaSilva, and M. S. Thompson, "On software tools and stack architectures for wireless network experiments," in *Proc. IEEE Wireless Communications and Networking Conference (WCNC)*, Cancun, Mexico, March 2011.
31. M. Baidas and A. B. MacKenzie, "Space-time network coding with optimal node selection for amplify-and-forward cooperative networks," in *Proc. IEEE Consumer Communications and Networking Conference (CCNC)*, Las Vegas, Nevada, January 2011.
32. F. Ge, A. Radhakrishnan, M. Y. ElNainay, Q. Chen, C. W. Bostian, and A. B. MacKenzie, "Software radio-based decentralized dynamic spectrum access networks: A prototype design and experimental results," in *Proc. IEEE Global Telecommunications Conference (GLOBECOM)*, Miami, Florida, December 2010.
33. Y. Shi, A. B. MacKenzie, L. A. DaSilva, K. Ghaboosi, and M. Latva-aho, "On resource reuse for cellular networks with femto- and macrocell coexistence," in *Proc. IEEE Global Telecommunications Conference (GLOBECOM)*, Miami, Florida, December 2010.
34. C. H. M. de Lima, K. Ghaboosi, M. Bennis, A. B. MacKenzie, and M. Latva-aho, "A stochastic association mechanism for macro-to-femto handover," in *Proc. Asilomar Conference on Signals, Systems, and Computers*, November 2010, pp. 1570–1574.
35. S. Namal, K. Ghaboosi, C. H. M. de Lima, M. Bennis, A. B. MacKenzie, and M. Latva-aho, "Joint admission control & interference avoidance in self-organized femtocells," in *Proc. Asilomar Conference on Signals, Systems, and Computers*, November 2010, pp. 1067–1071.
36. M. Nazir, M. Bennis, K. Ghaboosi, A. B. MacKenzie, and M. Latva-aho, "Learning based mechanisms for interference mitigation in self-organized femtocell networks," in *Proc. Asilomar Conference on Signals, Systems, and Computers*, November 2010, pp. 1886–1890.

37. M. S. Thompson, A. E. Hilal, A. S. Abdallah, L. A. DaSilva, and A. B. MacKenzie, "The MANIAC challenge: Exploring MANETs through competition," in *Proc. of the International Workshop on Wireless Networks: Communication, Cooperation, and Competition (WNC3)*, May 2010.
38. H. Liu, A. B. MacKenzie, and B. Krishnamachari, "Bargaining to improve channel sharing between selfish cognitive radios," in *Proc. IEEE Global Telecommunications Conference (GLOBECOM)*, Honolulu, Hawaii, November–December 2009.
39. M. D. Silvius, A. B. MacKenzie, and C. W. Bostian, "Rendezvous MAC protocols for use in cognitive radio networks," in *Proc. IEEE Military Communications Conference (Milcom)*, Boston, Massachusetts, October 2009.
40. S. A. Ahmad, J. Deaton, U. Shukla, R. Irwin, L. A. DaSilva, and A. B. MacKenzie, "A comparison of channel assignment techniques with power control in ad hoc networks," in *Proc. of the International Workshop on Cognitive Networks and Communications (COGCOM)*, 2009.
41. R. S. Komali, A. B. MacKenzie, and P. Mähönen, "On selfishness, local information, and network optimality: A topology control example," in *Proc. of the International Conference on Computer Communications and Networks (ICCCN)*, 2009.
42. R. Komali and A. MacKenzie, "Analyzing selfish topology control in multi-radio multi-channel multi-hop wireless networks," in *Proc. IEEE International Conference on Communications (ICC)*, June 2009, pp. 1–6.
43. M. D. Silvius, R. Rangnekar, A. B. MacKenzie, and C. W. Bostian, "The smart radio channel change protocol: A primary user avoidance technique for dynamic spectrum sharing cognitive radios to facilitate coexistence in wireless communication networks," in *Proc. of the International Conference on Cognitive Radio Oriented Wireless Networks (CrownCom)*, Hannover, Germany, June 2009.
44. A. Bell, S. Raman, A. B. MacKenzie, P. Plassman, C. Wyatt, L. A. DaSilva, L. Nazhandali, and M. Agah, "Increasing the enrollment, retention, and satisfaction of first-year students in electrical engineering, computer engineering, and computer science," in *Proc. ASEE Annual Conference and Exposition*, Austin, Texas, June 2009.
45. M. Y. ElNainay and A. B. MacKenzie, "Effect of non-cooperation on dynamic spectrum cognitive networks," in *Proc. of the International Wireless Communications and Mobile Computing Conference (IWCMC)*, Leipzig, Germany, June 2009, pp. 121–125.
46. M. Y. ElNainay, F. Ge, Y. Wang, A. E. Hilal, Y. Shi, A. B. MacKenzie, and C. W. Bostian, "Channel allocation for dynamic spectrum access cognitive network using localized island genetic algorithm," in *Proc. of the International Conference on Testbeds and Research Infrastructures for the Development of Networks and Communities (TridentCom)*, April 2009.
47. K. Ghaboosi, A. B. MacKenzie, L. A. DaSilva, A. S. Abdallah, and M. Latva-Aho, "A channel selection mechanism based on incumbent appearance expectation for cognitive networks," in *Proc. IEEE Wireless Communications and Networking Conference*, Budapest, April 2009, p. 6.
48. L. A. DaSilva, A. B. MacKenzie, C. R. C. M. da Silva, and R. W. Thomas, "Requirements of an open platform for cognitive networks experiments," in *Proc. IEEE Dynamic Spectrum Access Networks (DySPAN)*, Chicago, October 2008.
49. M. Y. ElNainay, D. H. Friend, and A. B. MacKenzie, "Channel allocation & power control for dynamic spectrum cognitive networks using a localized island genetic algorithm (short paper)," in *Proc. IEEE Dynamic Spectrum Access Networks (DySPAN)*, 2008.

50. D. H. Friend and A. B. MacKenzie, "Environmentally-friendly secondary network topology control for minimizing outage potential," in *Proc. IEEE Dynamic Spectrum Access Networks (DySPAN)*, Chicago, October 2008.
51. V. Srivastava, A. E. Hilal, M. S. Thompson, J. N. Chattha, A. B. MacKenzie, and L. A. DaSilva, "Characterizing mobile ad hoc networks — The MANIAC challenge experiment," in *Proc. of the ACM International Workshop on Wireless Network Testbeds, Experimental Evaluation, and Characterization (WiNTECH)*, San Francisco, September 2008.
52. A. E. Hilal, J. N. Chattha, V. Srivastava, M. S. Thompson, A. B. MacKenzie, and L. A. DaSilva, "Interactions between cooperation strategies in mobile ad hoc networks," in *Proc. ACM Workshop on Wireless Network Testbeds, Experimental Evaluation, and Characterization (WiNTECH)*, San Francisco, California, September 2008, pp. 99–100.
53. V. Srivastava, R. S. Komali, A. B. MacKenzie, and L. A. DaSilva, "Cooperation-aware topology control (invited paper)," in *Proc. International Symposium on Wireless Personal Multimedia Communications (WPMC)*, September 2008.
54. S. Raman, M. Agah, L. DaSilva, A. B. MacKenzie, C. Maxey, and A. Bell, "A first year engineering experience in wireless sensor networks for electrical/computer engineering and computer science students," in *Proc. ASEE Annual Conference and Exposition*, Pittsburg, PA, June 22–25 2008.
55. R. S. Komali and A. B. MacKenzie, "Impact of selfish packet forwarding on energy-efficient topology control," in *Proc. WiOpt: Modeling and Optimization in Mobile, Ad Hoc and Wireless Networks*, April 2008.
56. M. D. Silvius, F. Ge, A. Young, A. B. MacKenzie, and C. W. Bostian, "Smart radio: Spectrum access for first responders," in *Proc. of the SPIE Defense and Security Symposium: Wireless Sensing and Processing III*, vol. 6980, no. 1, 2008, pp. 698 008–1 – 698 008–12.
57. D. H. Friend, M. Y. ElNainay, Y. Shi, and A. B. MacKenzie, "Architecture and performance of an island genetic algorithm-based cognitive network," in *Proc. IEEE Consumer Communications and Networking Conference*, Las Vegas, January 10-12 2008, pp. 993–997.
58. R. Menon, A. B. MacKenzie, R. M. Buehrer, and J. H. Reed, "Joint power control and waveform adaptation for distributed networks," in *Proc. IEEE Global Telecommunications Conference (GLOBECOM)*, Washington, DC, November 2007, pp. 694–699.
59. T. W. Rondeau, A. B. MacKenzie, C. W. Bostian, K. E. Nolan, L. E. Doyle, C. Doerr, D. Grunwald, G. Minden, J. Evans, and D. Raychaudhuri, "International collaboration for a cognitive radio testbed," in *Proc. of the Software Defined Radio Technical Conference*, 2007.
60. J. Neel, R. Menon, A. B. MacKenzie, J. H. Reed, and R. P. Gilles, "Interference reducing networks," in *Proc. of the International Conference on Cognitive Radio Oriented Wireless Networks and Communications (Crown-Com)*, 31 July – 3 August 2007.
61. R. W. Thomas, R. S. Komali, L. A. DaSilva, and A. B. MacKenzie, "Joint power and channel minimization in topology control: A cognitive network approach," in *Proc. IEEE International Conference on Communications*, Glasgow, Scotland, June 24–28 2007, pp. 6538–6543.
62. J. E. Suris, L. A. DaSilva, Z. Han, and A. B. MacKenzie, "Cooperative game theory for distributed spectrum sharing," in *Proc. IEEE International Conference on Communications*, Glasgow, Scotland, June 2007, pp. 5282–5287.
63. R. Menon, A. B. MacKenzie, R. M. Buehrer, and J. H. Reed, "A game-theoretic framework for interference avoidance in ad hoc networks," in *Proc. of IEEE Global Conference on Communications*, 2006.

64. T. W. Rondeau, B. Le, D. M. Maldonado, D. Scaperoth, A. B. MacKenzie, and C. W. Bostian, "Optimization, learning, and decision making in a cognitive engine," in *Proc. of the Software Defined Radio Technical Conference*, Orlando, Florida, 2006.
65. L. A. DaSilva, A. B. MacKenzie, and G. C. Hadjichristofi, "Poster abstract: Mobile ad hoc network interoperability (MANIAC) challenge: Objectives and architecture," in *Proc. of the ACM International Symposium on Mobile Ad Hoc Networking (MobiHoc)*, 2006.
66. R. S. Komali and A. B. MacKenzie, "Distributed topology control in ad-hoc networks: A game theoretic perspective," in *Proc. IEEE Consumer Communications and Networking Conference*, vol. 1, January 2006, pp. 563–568.
67. R. W. Thomas, L. A. DaSilva, and A. B. MacKenzie, "Cognitive networks," in *First IEEE International Symposium on New Frontiers in Dynamic Spectrum Access Networks (DySPAN)*, November 2005, pp. 352 – 360.
68. J. Neel, R. Menon, A. B. MacKenzie, and J. H. Reed, "Using game theory to analyze physical layer cognitive radio algorithms," in *presented to the Conference on Economics, Technology, and Policy of Unlicensed Spectrum*, May 2005.
69. R. Menon, A. B. MacKenzie, R. M. Buehrer, and J. H. Reed, "Game theory and interference avoidance in decentralized networks," in *Proc. of the Software Defined Radio Technical Conference and Product Exposition*, November 2004.
70. J. E. Hicks, A. B. MacKenzie, J. A. Neel, and J. H. Reed, "A game theory perspective on interference avoidance," in *Proc. of IEEE Globecom*, vol. 1, 2004, pp. 257–261.
71. A. B. MacKenzie and S. B. Wicker, "Stability of multipacket slotted aloha with selfish users and perfect information," in *INFOCOM 2003. Twenty-second Annual Joint Conference of the IEEE Computer and Communications Societies*, vol. 3, 2003, pp. 1583–1590.
72. —, "Game theory in communications: Motivation, explanation, and application to power control," in *Proceedings of Globecom 2001*, vol. 2, 2001, pp. 25–29.
73. —, "Selfish users in aloha: A game theoretic approach," in *Proc. of the Fall IEEE Vehicular Technology Conference*, vol. 3, October 2001, pp. 1354–1357.

Invited Presentations

1. "Network Utility, Virtualization, and Resource Allocation in Future Wireless Networks," Queen's University Belfast, 28 April 2016.
2. "Some Thoughts on Future Wireless Networks," Virginia Tech, 28 August 2015.
3. "The Future of Wireless Resource Management: Bootstrapping and Automated Negotiation," Queen's University Belfast, 20 June 2013.
4. "The Future of Wireless Resource Management: Bootstrapping and Automated Negotiation," National University of Ireland, Maynooth, 9 May 2013.
5. "The Future of Wireless Resource Management: Bootstrapping and Automated Negotiation," Dublin Institute of Technology, 30 April 2013.
6. "The Future of Wireless Resource Management: Bootstrapping and Automated Negotiation," University College Cork, 11 February 2013.
7. "The Future of Wireless Resource Management: Bootstrapping and Automated Negotiation," Dublin City University, 22 January 2013.

8. "The Future of Wireless Resource Management: Bootstrapping and Automated Negotiation," CTVR, Trinity College Dublin, 26 October 2012.
9. "Dynamic Spectrum Access Networks: From Dream to Reality," CTVR, Trinity College Dublin, 29 June 2009.
10. "Dynamic Spectrum Access Networks: From Dream to Reality," Summer Research Institute, School of Computer and Communication Sciences, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, 26 June 2009.
11. "Dynamic Spectrum Access Networks: From Dream to Reality," RWTH Aachen University, Aachen, Germany, 25 June 2009.
12. "Building and Analyzing Cognitive Radio Networks," Graduate Seminar, Old Dominion University, 28 March 2008.
13. "RF/System Requirements for Cognitive Radio," presented at the *IEEE International Microwave Symposium*, 2007 (with C. W. Bostian and S. Raman).
14. "Analyzing Cognitive Radio Networks with Game Theory," MIT Lincoln Labs, Boston, Massachusetts, 12 July 2006.
15. "Analyzing Cognitive Radio Networks with Game Theory," Cornell University, Ithaca, New York, 10 July 2006.
16. "Analyzing Cognitive Radio Networks with Game Theory," Electrical Engineering Department, University of Southern California, Los Angeles, 27 June 2006.
17. "Analyzing Cognitive Radio Networks with Game Theory," Electrical Engineering Department, University of California Los Angeles, 26 June 2006.

Sponsored Research Projects

1. "NSC-16-RPP-04: LTE Output Power Characterization and LTE Output Power Aggregation Models," National Spectrum Consortium (VT is subcontract from Draper), \$995,409 from 2/2017–8/2018, Co-PI with 10% responsibility (\$99,541).
2. "NeTS: Medium: Implications of Receiver RF Front End Nonlinearity on Network Performance: Fundamentals, Limitations, and Management Strategies," National Science Foundation, \$830,356 from 5/2016–5/2019, Co-PI with 20% responsibility (\$166,071).
3. "NeTS: Small: Enabling Cellular Networks to Exploit Millimeter-wave Opportunities (NEMOs)," National Science Foundation, total project is \$1.4M with researchers in Ireland and the UK, VT portion is \$499,293 from 10/2015–9/2018, PI with 50% responsibility (\$249,647).
4. "Collaborative Research: Virtualized Wireless Networks and Their Impact on Capacity Markets," National Science Foundation, \$400,000 from 1/2015–12/2017, PI with 50% responsibility (\$200,000). Collaborative research with the University of Pittsburgh.
5. "Collaborative Research: EAGER: Global Spectrum Opportunity Assessment," National Science Foundation, \$124,056 from 2/2013 – 1/2016, PI with 100% responsibility.
6. "Game Theoretic Cross-Layer Control Mechanism for Tactical Networks," US Army CERDEC, \$69,768 from 6/2011 – 2/2013, PI with 100% responsibility.
7. "Economic Models for Collaborative Access Network Provisioning: US-Finland Collaboration," National Science Foundation, \$290,000 from 9/2011 - 8/2013, PI with 50% responsibility (\$145,000).
8. "NeTS: Small: Collaborative Research: The Flexible Internetwork Stack (FINS) Framework," National Science Foundation, \$348,641 from 9/2009 - 9/2012, PI with 90% responsibility (\$313,777). REU supplement of \$16,000 also obtained.

9. "Reasoning and Learning in Adaptive Wireless Networks," BBN Technologies (subcontract on DARPA-funded project), initial phase of \$219,870 from 9/2007 to 12/2008, Co-PI with 25% responsibility (\$54,968). A second phase of \$319,187 from 4/09 to 3/10 with MacKenzie as PI with 25% responsibility (\$79,797).
10. "A Discovery-Based First Year Electrical and Computer Engineering Course Emphasizing Real-World Projects that Benefit Society," National Science Foundation, \$150,000 from 1/2007 to 12/2008, 11% responsibility (\$16,500).
11. "Network Advisory Board for DARPA WANN Team," M/A-Com (subcontract on DARPA-funded project), \$25,000 from 12/2006 - 6/2007, 50% responsibility (\$12,500).
12. "NeTS-ProWIN: An Enabling Technology for Wireless Networks - The VT Cognitive Engine," National Science Foundation, \$749,796 from 9/2005 to 8/2008, 23% responsibility (\$172,453).
13. "A Prototype Public Safety Cognitive Radio for Universal Interoperability," National Institute of Justice. Initial project was for \$419,995 from 10/05 - 3/07, 33% responsibility (\$138,598). A first continuation was funded at \$725,000 from 2/2007 - 1/2008, 20% responsibility (\$145,000). A second continuation was funded at \$500,000 from 2/2008 to 1/2009, 20% responsibility (\$100,000).
14. "NeTS-NBD: Mobile Ad Hoc Networking Interoperability and Cooperation Challenge (MANIAC Challenge)," National Science Foundation, \$450,000 from 8/2005 to 7/2008, 50% responsibility (\$225,000).
15. "CAREER: Game Theoretic Models of Cooperation in Wireless Networks," National Science Foundation, \$400,000 from 6/2005 to 5/2012, 100% responsibility (\$400,000).

Courses Taught

1. ECE 2704: Signals and Systems (Fall 2018)
2. ECE 6604: Advanced Topics in Communications: Millimeter Wave Communications and Networking (Spring 2018)
3. ECE 3614: Introduction to Communication Systems (Fall 2017, Fall 2016, Fall 2015, Fall 2014, Spring 2014, Spring 2005, Fall 2003)
4. ECE 4614: Telecommunication Networks (Spring 2017, Spring 2014, Spring 2012, Spring 2010, Spring 2009, Spring 2007)
5. ECE 5544: Coding Theory (Spring 2017, Spring 2015, Fall 2009, Fall 2007, Spring 2004)
6. ECE 5634: Information Theory (Spring 2016, Fall 2013, Fall 2008, Fall 2006)
7. ECE 5605/BMES 5525: Stochastic Signals and Systems I (Fall 2015, Fall 2011, Fall 2005, Fall 2004)
8. ECE 2574: Introduction to Data Structures and Algorithms (Spring 2011)
9. ECE 5984: Special Studies: Cognitive Radios, Cognitive Networks, and Dynamic Spectrum Access (Spring 2008)
10. ECE 5565: Network Architectures and Protocols I (Fall 2005)
11. ECE 5606: Stochastic Signals and Systems II (Co-taught, Spring 2005)

Graduate Students Advised

1. Shubhajeet Chatterjee, Ph.D. expected 2019.
2. Kory Teague, M.S. 2018, with U.S. Naval Research Laboratory.
3. Amr Abdelfattah, Ph.D. 2017.
4. Sai Nisanth Bodepudi, M.S. 2017 (co-advised with Harpreet Dhillon).
5. Abdallah S. Abdallah, Ph.D. 2016, Assistant Professor at Penn State Behrend.

6. Ji (Tracey) Wang, M.S., 2016 (co-advised with Luiz DaSilva).
7. Cameron W. Patterson, M.S. 2014.
8. Varuni K. Sastry, M.Eng. 2014.
9. Ramakrishnan Kalyanaraman, M.Eng. 2014.
10. Jonathan Reed, M.S. 2014.
11. Amr Hilal, Ph.D. 2013, Head of Informatics Lab, Virginia Tech Library.
12. William Rogers, M.S. 2013, Engineer at BIT Systems.
13. Ryan Irwin, Ph.D. 2012 (co-advised with Luiz DaSilva), Engineering Fellow at Insight Data Science.
14. Frank Bieberly, M.S. 2012, Engineer at MIT Lincoln Labs.
15. Mohammed Baidas, Ph.D. 2012, Associate Professor at Kuwait University.
16. Uchenna Anyanwu, M.S. 2012.
17. Yongsheng Shi, Ph.D. 2010, Engineer at Qualcomm.
18. Umesh Shukla, M.S. 2010, Engineer at Apple.
19. Mark Silvius, Ph.D., 2009, Assistant Professor at Air Force Institute of Technology (co-advised with Charles Bostian).
20. Mustafa ElNainay, Ph.D. 2009, Professor at Alexandria University, Egypt.
21. Daniel H. Friend, Ph.D. 2009, Associate at Zeta Associates.
22. Ramakant S. Komali, Ph.D. 2008, Engineer at Cisco Systems.

Postdoctoral Associates Advised

1. Mohammad J. Abdel-Rahman, 2015–2017.

Other Teaching Activities

Designed an innovative research-focused special topics course (ECE 6604: Advanced Topics in Communications: Millimeter Wave Communications and Networking) with participation from students and faculty from Trinity College Dublin and Queen's University Belfast and leading researchers in this emerging area as guest speakers. This course was taught during Spring 2018.

Taught a nine-session short course titled "Game Theory for Wireless Engineers" at Trinity College Dublin during the 2012-2013 academic year.

Taught two invited short courses at the Centre for Wireless Communications, University of Oulu, Finland. In February 2008, taught a three-day short course titled "Cognitive Radios and Cognitive Networks" with Luiz DaSilva. In May 2009, taught a two-day short course titled "Resource Management for Dynamic Spectrum Access" also with Luiz DaSilva.

Designed an innovative research-focused special topics course (ECE 5984: Special Studies: Cognitive Radios, Cognitive Networks, and Dynamic Spectrum Access) with a significant international component (including participation from students at Trinity College, Dublin) and leading researchers in this emerging area as guest speakers. This course was taught during Spring 2008.

Developed a module to teach first-year electrical and computer engineering and computer science students about medium access control in a wireless network under NSF support. This module, which included a significant hands-on component and emphasized the importance of communications systems to society, was part of a redesign of ENGE 1104: Engineering Our Digital Future. This project was selected as an IEEE Real World Engineering Project, and is now available on the RWEP website.

Participated in major course revisions, including revisions of of ECE 3614: Introduction to Communication Systems, ECE 4614: Telecommunication Networks, and ECE 5544: Coding Theory.

Selected Professional Service

Area Editor, *IEEE Transactions on Communications*, 2013–present.

Associate Editor, *IEEE Transactions on Cognitive Communications and Networking*, 2014–present.

Workshops Co-Chair, *IEEE International Conference on Communications*, 2020

Associate Editor, *IEEE Transactions on Mobile Computing*, 2011–2016.

Tutorials Co-Chair, *IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN)*, 2014.

Dynamic Spectrum Management Track Chair, *International Conference on Cognitive Radio Oriented Wireless Networks (Crowncom)*, 2014.

Associate Editor, *IEEE Transactions on Communications*, 2011–2013.

Guest Editor, *IEEE Communications Magazine*, feature topic on Game Theory, September 2011.

Poster and Travel Grants Chair, IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN), 2011.

Co-chair, GameNets 2006: Workshop on Game Theory for Networks, Piza, Italy, Oct. 14, 2006.

Proposal Reviewer, National Science Foundation, Science Foundation of Arizona, Academy of Finland (Suomen Akatemia), and Army Research Office.

Member of Technical Program Committee for numerous international conferences, workshops and symposia.

Reviewer for numerous top-tier international journals.

Selected University Service

Area Chair of Communications Area, 2013–present, 2010–2012.

Associate Director of Wireless @ Virginia Tech, 2015–present.

Member, ECE Curriculum Committee, 2013–present, 2010–2012.

Co-Chair, Faculty Search Committee in Wireless, 2013–2014.

Graduate Recruiting Representative, Communications Area, 2013–2014, 2009–2010, 2008–2009.

EE Subcommittee Chair, ECE Curriculum Committee, 2011–2012.