Curriculum Vita, Gerald L. Fudge, May 2023

Instructor: Gerald (Jerry) Fudge, Assistant Professor
Academic Department: Engineering and Technology

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FORMAL EDUCATION

- M.A. in Science and Religion, Biola University, May 2020
- Ph.D. Electrical Engineering, University of Texas at Dallas, Dec. 1994
    - *Robust Calibrated Adaptive Beamforming for Wideband Signals in Non-ideal Conditions*
- Masters Applied Mathematical Sciences, Rice University, May 1984
- BA Math, Rice University, May 1983

OTHER EDUCATION

- Introduction to Machine Learning, 2019 (L3Harris Work Study Group)
- Bioinformatics I, Oct 2014-Jan 2015, UC San Diego (Coursera)
- Military Courses, 1984-1989: Sonar theory and practice, ocean acoustics, introductory aeronautical engineering & compressible fluid flow, thermodynamics, nuclear engineering theory and practice, power plant theory and practice, material science, radiochemistry

TEACHING EXPERIENCE

- Assistant Professor, Engineering & Technology, TAMU-Commerce, Fall 2021-present: Introduction to Engineering (ENGR 110); Computing for Engineers (ENGR 2304); Circuit Theory II (EE 309); Engineering Probability & Statistics (ENGR 213); Special Topics in EE: Electronic Warfare and Machine Learning (EE 497); Special Topics in Computer Science: DSP & Machine Learning (CSCI 597); Independent Study: Circuit Modeling of Biological Systems (EE-489); Honors Thesis (EE-490)
- Visiting Research Professor, Naval Postgraduate School (courtesy appointment), Winter quarter 2012: Compressive Sensing Techniques for Electronic Warfare (EC4900 seminar)
- Adjunct Lecturer, UT-Dallas, Spring 1996 semester: Signals and Systems
- Math Department Grader, Rice University, 1981-1984: Various classes in theoretical and applied mathematics, ranging from differential equations to abstract algebra / group theory

RESEARCH & PUBLICATION INTERESTS

- Systems biology, including developing engineering models of interferon
- Machine learning & related statistical applications in complex systems
- Ultra-wideband radio frequency receivers based on folding and compressive sensing
- Issues pertaining to the intersection of science, engineering, and faith
- Innovation in engineering

WORK EXPERIENCE

- Texas A&M University-Commerce, 8/21 – present (Assistant Professor, Electrical Engineering).
  - Teach undergraduate classes in engineering and perform engineering research
- L3Harris Technologies, Integrated Mission Systems, 9/94 – 7/21 (retired as Senior Fellow).
  - Led research and development projects involving electronic intelligence (ELINT) receiver technology; developed externally funded R&D; performed technical marketing to support business development of large programs; performed systems engineering for technology transition from R&D to operational deployment; developed ultra-wideband low size, weight, & power digital RF receiver technology motivated by compressive sensing principles; developed modeling and analysis tools and methodology for ELINT receivers; developed signal classifiers and ELINT detection and measurement algorithms; mentored engineers; initiated autonomous intelligent network sensor research effort; developed spatial control algorithms for 3-axis ship-borne antenna; coded embedded systems
- University of Texas at Dallas, 1/91 – 9/94 (Research Associate & Student).
  - Designed adaptive array processing algorithms that account for real-world problems such as array errors, reverberation, and direction errors. Evaluated algorithms using data collected with acoustic arrays (8-channel and 32-channel) built at UTD
- U.S. Navy Submarine Officer, 5/84 – 12/90 (honorable discharge as a Lieutenant).
  - Developed cruise missile and over-the-horizon targeting tactics based on system performance and targeting algorithms. Coordinated division-level nuclear engineering training. Conducted target tracking using a variety of passive sonar systems (towed array, cylindrical bow array, hull-mounted conformal array). Directed maintenance and repair of nuclear mechanical systems, diesel, and nuclear control & instrumentation equipment

REFEREED PUBLICATIONS, NON-ITAR RESTRICTED

1. Robert Penno, Stephen T. Ha, G.L. Fudge, "The effect of spurious modes on the wideband application of the N-arm spiral to direction finding," *Proc. AeroConf 2017 IEEE Aerospace Conference*, 4 March 2017.
2. G. L. Fudge, H. M. Azzo, F. A. Boyle, "A reconfigurable direct RF receiver with jitter analysis and applications," *IEEE Trans. on Circuits and Systems I: Regular Papers*, pp. 1-10, January 2013.
3. R. Maleh, G. L. Fudge, F. A. Boyle, P. E. Pace, "Analog-to-information and the Nyquist folding receiver," *IEEE Journal on Emerging and Selected Topics in Circuits and Systems*, pp. 564-578, Sep. 2012.
4. O. O. Odejide, C. M. Akujuobi, A. Annamalai, G. Fudge, "Joint design of channel-source coding for compressive sampling systems," *Proc. IEEE Consumer Communications and Networking Conference (CCNC), 2010,* 9-12 Jan 2010.

5. P.E. Pace, G.L. Fudge, A. Kusmanoff, "Nyquist folding analog-to-information autonomous information recovery using quadrature mirror filtering," *Asilomar Conference on Signals, Systems, and Computers (ACSSC),* 1 Nov. 2009.
6. O. O. Odejide, C. M. Akujuobi, A. Annamalai, G. Fudge, "Application of analytic wavelet transform for signal detection in Nyquist folding analog-to-information receiver," *Proc. IEEE International Conference on Communications* (*ICC*), June 14-18, 2009.
7. O. O. Odejide, C. M. Akujuobi, A. Annamalai, G. Fudge, "Signal and modulation type detection using wavelet transform," *Proc. 2009 WRI World Congress on Computer Science and Information Engineering*, March 31-April 2, 2009.
8. G. Fudge, R. Bland, M. Chivers, S. Ravindran, J. Haupt, P. Pace, "A Nyquist folding analog-to-information receiver," *ACSSC-2008,* Oct. 2008.
9. P. Scerri, V. Von Gonten, G. Fudge, S. Owens, K. Sycara, "Transitioning multiagent technology to UAV applications," *Autonomous Agents and Multi-Agent Systems* AAMAS 2008.
10. G. L. Fudge, M. A. Chivers, S. Ravindran, R. E. Bland, P. E. Pace, "A reconfigurable direct RF receiver architecture," *IEEE International Symposium on Circuits and Systems*, 2008.
11. C. M. Akujuobi, O. O. Odejide, G. L. Fudge, "Sparseness measures of signals for compressive sampling," *IEEE Symposium on Signal Proc. and Information Technology*, 15-18 Dec 2007.
12. G. Fudge, P. Deignan, J. Anderson, E. Owoye, P. Scerri, R. Glinton, "Adaptive distributed sensing for emitter localization with autonomous UAV team cooperation," *Adaptive Sensor Array Processing (ASAP) Workshop*, 5-6 June 2007, MIT-Lincoln Laboratory.
13. Frank A. Boyle, Jarvis Haupt, Gerald L. Fudge, Chen-Chu A. Yeh, "Detecting signal structure from randomly sampled data," *IEEE Statistical Signal Processing Workshop* 2007, Aug. 26-29.
14. Jarvis Haupt, Rui Castro, Robert Nowak, Alex Yeh, Gerald Fudge, "Compressive sampling for signal classification," *ACSSC-2006,* 29 Oct – 1 Nov 2006.
15. Gerald L. Fudge and Darel A. Linebarger, "Spatial blocking filter derivative constraints for the generalized sidelobe canceller and MUSIC," *IEEE Trans. on Signal Processing*, Jan. 1996.
16. Gerald L. Fudge and Darel A. Linebarger, "Derivative constraints for high resolution direction finding with correlated interferers," *Proc. DSP Technology Conference, SPIE AeroSense Symposium,* April 1996.
17. D. A. Linebarger, R. D. DeGroat, E. M. Dowling, P. Stoica, and G. L. Fudge, "Incorporating *a priori* information into MUSIC- algorithms and analysis," *Signal Proc.*, vol. 46, no. 1, 1996.
18. D. Linebarger, R. DeGroat, E. Dowling, G. Fudge, P. Stoica, "Analysing the effects of constraints and inter-signal coherence on the MUSIC algorithm," ICASSP-95, 9-12 May 1995.
19. Gerald L. Fudge and Darel A. Linebarger, "A calibrated generalized sidelobe canceller for wideband beamforming," *IEEE Transactions on Signal Processing*, Oct. 1994.
20. Gerald L. Fudge and Darel A. Linebarger, "Steered response control of the generalized sidelobe canceller," *Proc. IEEE ICASSP*, May 1995.
21. Gerald L. Fudge and Darel A. Linebarger, "Optimal array calibration to minimize signal cancellation in adaptive wideband beamformers," *Proc. ACSSC-1993,* Nov. 1993.

REFEREED PRESENTATIONS, NON-ITAR RESTRICTED

1. Emily B. Reeves, Gerald L. Fudge, "Promise of systems modeling to clarify the metabolic architecture of life," *Potential & Limitations of Evolutionary Processes*, 8-12 May 2022, Israel.

REFEREED PUBLICATIONS & PRESENTATIONS, ITAR RESTRICTED

1. G. L. Fudge, Carlin Willard, Jerry Yancey, "MADDAWG: A Multi-arm Antenna, Direction-finding and Detection Architecture for Wideband Geolocation," *Proc. GOMACTech-2021*, March 29 - April 1, 2021, Virtual Conference.

2. F. Boyle, B. Holden, Jerry Fudge, "Collaborative passive geolocation technologies for multiple platforms," *45th Annual Collaborative Electronic Warfare Symp.*, April 6-7, Pt. Mugu, 2016.
3. Ray Maleh, Jerry Fudge, Frank Boyle, "Hypergraph learning of EW Network Topologies," *43rd Annual collaborative Electronic Warfare Symposium*, April 8-10, Pt. Mugu, 2014.
4. G. L. Fudge, Brian C. Rutherford, A. Agoston, "Nyquist folding receiver for analog-to-information," *Proc. GOMAC-2012*, 21 March 2012, Las Vegas, NV.
5. G. Fudge, B. Rutherford, M. Legako, M. Sapp, "Nyquist folding receiver airborne test results for radar detection," *Proc. 57th Annual MSS Tri-Service Radar Symposium*, 27-30 June 2011, NPS, Monterey, CA.
6. G. Fudge, F. Boyle, R. Maleh, "Nyquist-folding receiver for compressive sensing of LPI waveforms", *Proc. 2nd Annual AOC Symp. on LPI Radar Design Strategies & Counter-LPI Technology*, 15-18 February, 2011, NPS, Monterey, CA.
7. G. Fudge, F. Boyle, R. Maleh, B. Rutherford, M. Legako, "Matched filter methods for processing of Nyquist-folding receiver data," *Proc. 2nd Annual AOC Symp. on LPI Radar: Design Strategies & Counter-LPI Technology*, 15-18 February, 2011, NPS, Monterey, CA.
8. Gerald Fudge and Frank Boyle, "Nyquist folding receiver for LPI signals," *Proc. 2009 AOC Symposium on LPI Radar Design Strategies and Counter- LPI Technology*, Nov. 17-19, 2009, NPS, Monterey, CA.

PATENTS AWARDED

1. G.L. Fudge, R. Lange, C. A. Coffey, F. A. Boyle, C. Johnson, C. A. Fox, "Multiple clock sampling for Nyquist folded sampling receivers," US-11251832-B2, 2022-02-15.
2. R. Maleh, F.A. Boyle, G.L. Fudge, "Systems and methods for signal detection and estimation," US-8660218-B2, 2014-02-25.
3. Deepak Prasanna, G.L. Fudge, "Heterogeneous reconfigurable agent compute engine (HRACE)," US-8589935-B2, 2013-11-19.
4. G.L. Fudge, M.A. Chivers, S. Ravindran, Alex Chen-Chu Yeh, "System and method for clock jitter compensation in direct RF receiver architectures," US-8509368-B2, 2013-08-13.
5. G.L. Fudge, R.E. Bland, S. Ravindran, M.A. Chivers, "System and method for improved spur reduction in direct RF receiver architectures," US-8509354-B2, 2013-08-13.
6. G.L. Fudge, Scott Burkart, Antone Kusmanoff, "Multiple projection sampling for RF sampling receivers," US-8401050-B1, 2013-03-19.
7. G.L. Fudge, "Wideband frequency hopping spread spectrum transmitters and related methods," US-8249129-B2, 2012-08-21.
8. G. L. Fudge, "Wideband frequency hopping spread spectrum receivers and related methods," US-8184673-B2, 2012-05-22.
9. G. L. Fudge, "Wideband frequency hopping spread spectrum transceivers and related methods," US-8149894-B2, 2012-04-03.
10. F. A. Boyle, G. L. Fudge, Alex Chen-Chu Yeh, "Systems and methods for construction of time-frequency surfaces and detection of signals," US-8121222-B2, 2012-02-21.
11. G. L. Fudge, "Interference cancellation for reconfigurable bandpass sampling interference cancellation," US-8081946-B2, 2011-12-20.
12. G. L. Fudge, R. Bland, A. Kusmanoff, "Systems and methods for interference cancellation," US-8078130-B2, 2011-12-13.
13. Alex Chen-Chu Yeh, Gerald L. Fudge, "Compressed sensing characterization system and method," US-7916052-B2, 2011-03-29.
14. Gerald L. Fudge, "Method and computer program for group delay and magnitude equalization with relaxed phase slope constraint," US-7831648-B2 / 2010-11-09.

15. Gerald L. Fudge, Boyd Gallatin, "Swept bandpass filter frequency modulated continuous wave (FMCW) receiver and related method," US-7496158-B2, 2009-02-24.
16. Gerald L. Fudge, "Reconfigurable direct RF bandpass sampling receiver and related methods," US-7489745-B2, 2009-02-10.
17. G. L. Fudge, J. E. Harvey, M. A. Chivers, S. Ravindran, "Nyquist folded bandpass sampling receivers and related methods," US-7436912-B2, 2008-10-14.
18. G. L. Fudge, J. E. Harvey, M. A. Chivers, S. Ravindran "Nyquist folded bandpass sampling receivers with narrow band filters for UWB pulses and related methods," US-7436911-B2, 2008-10-14.
19. G. L. Fudge, J. E. Harvey, M. A. Chivers, S. Ravindran, "Direct bandpass sampling receivers with analog interpolation filters and related methods," US-7436910-B2, 2008-10-14.
20. Mark L. Wood, Alex Yeh, Gerald L. Fudge, "Method and apparatus for compressed sensing using analog projection," US-7345603-B1, 2008-03-18.
21. Gerald L. Fudge, Mark L. Wood, Alex Yeh, "Method and apparatus for compressed sensing," US-7289049-B1, 2007-10-30.
22. Gerald L. Fudge, Ross A. McClain, Jr., "Systems and methods for analog to digital conversion," US-7091894-B2, 2006-08-15.
23. E. Scott Baker, Gerald L. Fudge and Ross A. McClain, Jr., "Systems and methods for multi-channel analog to digital conversion," US-6956517-B1, 2005-10-18.
24. Stewart C. O'Dell, Clint D. Schreiner, Gerald L. Fudge, Michael R. Legako, "Method and system for-down-converting a signal," US-6452982-B1, 2002-09-17.

TRADE SECRETS

1. Frank Boyle, Gerald Fudge, "Reduced Ambiguity Precision Interferometry Direction Finding (RAPIDF)," L3 ISR Systems, 2019.
2. G. L. Fudge, "System & Method for Nyquist Folding Receivers with Gain Differential, L-3 Communications," 2013.
3. M.D. Sapp, F.A. Boyle, G.L. Fudge, C.A. Coffey, "Computationally Efficient High PRF Detection," L-3 Communications, 2008.

OTHER PUBLICATIONS & PRESENTATIONS

1. Jerry Fudge, Frank Boyle, Terry Johnson, "Reduced Ambiguity Precision Interferometry Direction Finding (RAPIDF)," *L3 Technologies TechEx18*, November 12-13, 2018.
2. G. Fudge, S. Wilson, T. Simpson, "Photonic Nyquist folding receiver," *L-3 Communications TechEx16*, September 12-13, 2017 (selected as best paper in track).
3. H. Azzo, G. Fudge, "Structured test vectors: methodologies and techniques," *L-3 Communications TechEx16*, September 12-13, 2017.
4. G. Fudge, F. Boyle, W. Dunn, C. Johnson, "Nyquist folding receiver," *L-3 Communications TechEx16*, September 13-14, 2016.
5. R. Maleh, F.A. Boyle, G.L. Fudge, "Corduroy: enhanced adaptive compressed Sensing of LPI chirped signals," *L-3 Communications TechEx15*, September 15-16, 2015.
6. R. Maleh, F.A. Boyle, H.A. Azzo, G.L. Fudge, "Sub-Nyquist detection and estimation of chirped pulse streams using auto-focus, X-gram, and the Nyquist folding receiver," *L-3 Communications TechEx13*, September 17-18, 2013 (selected as best paper in track).
7. R. Maleh, F.A. Boyle, G.L. Fudge, "X-gram: rapid spectral visualization of parameterized signal types," *L-3 Communications TechEx13*, September 17-18, 2013.
8. R. Maleh, G. L. Fudge, "RIP analysis of modulated sampling schemes for recovering spectrally sparse signals," arXiv:1207.7347v1, 31 July 2012.

9. G. L. Fudge, R. Maleh, S. M. Burkart, T. B. Simpson, "Method for efficient wideband demodulation," *L-3 Communications TechEx10,* September 21-22, 2010.
10. Gerald L. Fudge, "Receiver interference from own platform," *ONR Simultaneous Transmit and Receive (STAR) Workshop,* 23-14 September, 2009, Arlington, VA.
11. Gerald L. Fudge, "A2I and direct RF interference cancellation," *ONR Simultaneous Transmit and Receive (STAR) Workshop*, 23-14 September, 2009, Arlington, VA.
12. F. Boyle, G. L. Fudge, "Nyquist folding receiver & DARPA Analog-to-Information program," *L-3 Communications Engineering Conference*, 15-17 September, 2008.
13. Gerald Fudge and Frank Brandon, "Multi-agent control of autonomous systems & DARPA LANdroids program," *2008 L-3 Engineering Conf.*, 16-17 Sept. 2008, Salt Lake City, Utah.
14. Jerry Fudge, "FFT-based CFAR detection & estimation," *3rd Annual Processing Technology Expo, Raytheon PSTN*, June 6 – June 8, 2000, Tucson, Arizona.
15. Jerry Fudge, "Fast approximate ArcTan algorithm for DSP applications," *3rd Annual Processing Technology Expo, Raytheon PSTN*, June 6 – June 8, 2000, Tucson, Arizona.
16. Jerry Fudge, "SPIDER-80 digital ELINT receiver," *2nd Annual Processing Technology Expo, Raytheon Proc. Systems Technology Network (PSTN)*, Sept. 29 – Oct 1, 1999, El Segundo, CA.
17. Jerry Fudge, Mike Legako, and Clint Schreiner, "The polyphase downconverter: An approach to efficient wideband digital downconversion," *Proc. International Conference on Signal Processing Applications and Technology*, September 1998, Toronto, Canada.

OTHER PROFESSIONAL ACTIVITIES

- Reviewer for *IEEE Transactions Aerospace Electronic Systems* 2011-2017
- Visiting Research Professor, Naval Postgraduate School (courtesy appointment), Compressive Sensing Techniques for Electronic Warfare, EC4900 seminar, winter quarter 2012
- Jerry Fudge, "Digital ELINT receiver technology for airborne applications," *IEEE AESS Dallas Section Meeting*, 28 January 2003, Richardson, TX
- Digital Receiver session co-chair, *3rd Annual Processing Technology Expo, Raytheon PSTN*, June 6 – June 8, 2000, Tucson, Arizona
- Digital Receivers session co-chair, *2nd Annual Processing Technology Expo, Raytheon Proc. Systems Technology Network (PSTN)*, Sept. 29 – Oct 1, 1999, El Segundo, CA
- Programmable Hardware session co-chair, *1st Annual Processing Technology Expo, Raytheon PSTN*, Oct. 1998
- Array Processing session chair, *DSP Technology Conference, SPIE Aero Sense Symposium*, April 1996, Orlando, Florida
- Adjunct Lecturer, Signals and Systems, University of Texas at Dallas, Spring 1996 semester.
- Director, 1984 Rice Invitational Math Contest for High School Students

SELECTED EXTERNALLY FUNDED RESEARCH & DEVELOPMENT WITH APPROXIMATE VALUES

- 2020-2024, AFRL-Rome, Advanced Exploitation of ELINT Signals, Task 2, $2.7M
- 2016-2023, AFRL-Dayton, Multi-arm Antenna, Direction-Finding, and Detection Architecture for Wideband Geolocation (MADDAWG), $5.4M
- 2015-2019, AFRL-Rome, Enhanced ELINT Exploitation Processor, Task 2, $1.3M
- 2013-2015, AFRL-Dayton, Wideband Array Time-delay steered Compressive-sensing High-band Receiver (WATCHeR), $760K
- 2008-2012, DARPA / AFRL-Dayton, A2I Receiver Development, $5.6M
- 2006-2007, DARPA / AFRL-Dayton, Analog-To-Information (A2I) Study, $800K
- 2000-2002, U.S. Army CECOM, Spider-80 Digital ELINT Receiver, $880K

SELECTED AWARDS

- 2020 Selection as L3Harris Senior Fellow
- 2020 Enterprise Collaboration Award
- 2020 Advanced Technology Development Leadership Award
- 2016 L3 Technologies Engineers of the Year (one of ten)
- 2010 L-3 Mission Integration Division Top Star Award (team award)
- 2004 L-3 Integrated Systems Tribute to Excellence Award, Technology and Innovation
- 1996 Raytheon E-Systems Paper of the Year Award

PROFESSIONAL MEMBERSHIPS

- Senior Member IEEE

PROFILES

- Google Scholar: https://scholar.google.com/citations?hl=en&user=3hLEICsAAAAJ
- Scopus: https://www.scopus.com/authid/detail.uri?authorId=6602572440