Andrew K. Bolstad

Contact Information

Department of Electrical and Computer Engineering
Iowa State University
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Research Interests

Nonlinear signal processing, spectrum warfare, machine learning, sparse signal processing, compressed sensing

Experience

Adjunct Assistant Professor
Department of Electrical and Computer Engineering, Iowa State University — Jan 2018–present

Technical Staff
Advanced RF Techniques and Systems, MIT Lincoln Laboratory — Oct 2013–Dec 2017
Embedded and Open Systems, MIT Lincoln Laboratory — Sep 2009–Oct 2013

Summer Intern
Embedded Digital Systems, MIT Lincoln Laboratory — Jun 2008–Aug 2008
Embedded Digital Systems, MIT Lincoln Laboratory — May 2006–Aug 2006

Education

PhD Electrical Engineering
University of Wisconsin, Madison, 2009

MS Electrical Engineering
University of Wisconsin, Madison, 2006

BS Electrical Engineering with Distinction
Minors: Mathematics and German, Iowa State University, Ames, 2002

Funding

High Frequency Nonlinear Digital Predistortion — July, 2019–August, 2022
MIT Lincoln Laboratory University Subcontract, PI — $229k

Open Signals and Systems Laboratory Exercises — July, 2019–June, 2020
ISU Miller Open Education Mini-Grant, co-PI — $2.5k

Wideband Hardware and Signal Processing Technology — July, 2018–June, 2019
MIT Lincoln Laboratory University Subcontract, PI — $74k

Physical Layer Signature Discrimination of Transmitters — June, 2018–July, 2019
Kostas Research Institute for Homeland Security at Northeastern University, Sub-PI — $18k

Array-based Compressed Sensing Receiver — October, 2014–September, 2016
MIT LL Internal R&D Congressional Line Funding, co-PI/PI — $550k (FY15), $650k (FY16)

Next Generation Embedded Processor — October, 2012–September, 2013
MIT LL Internal R&D Congressional Line Funding, co-PI — $740k

Pseudorandom Optical Sampling-Enabled ADC — January, 2012–September, 2012
MIT LL Internal R&D Congressional Line Funding, PI — $100k

Extremely Wideband Compressive Samplers — April, 2011–September, 2011
MIT LL Internal R&D Technology Office Seedling, PI — $250k

Honors and Awards

ISU College of Engineering Early Achievement in Teaching Award, 2021
ISU Engineering Student Council Outstanding Engineering Faculty Award, 2021
Boast-Nilsson Educational Impact Award, 2019
GOMACTech Best Poster Paper Award, 2015
IEEE Senior Membership Elevation, 2015
MIT Lincoln Laboratory Team Award, 2012
National Merit Scholar, 1998

Journal Papers

W. Wang, N. Estes, N. Garcia, M. Roddy, **A. Bolstad**, and J. Chisum, "Sparse Phased-array-fed GRIN Lens Antennas for Low-cost and Low-power Wide-angle Beamscanning," (*in revision, IEEE Trans. Antennas and Prop.*).

S.M. Moe, J.L. Webb, **A.K. Bolstad**, and E.M. McNeill, "Identification of conserved transcriptome features between humans and *Drosophila* in the aging brain utilizing machine learning on combined data from the NIH Sequence Read Archive," *PLoS ONE*, vol. 16, no. 8, August 2021.

A.K. Bolstad, "Identification of Generalized Memory Polynomials using Two-Tone Signals," *IEEE Trans. Sig. Proc.*, vol. 66, no. 16, pp. 4280-4290, August 2018.

A. Bolstad, B. Van Veen, and R. Nowak, "Causal Network Inference via Group Sparse Regularization," *IEEE Trans. Sig. Proc.*, vol. 59, no. 6, pp. 2628-2641, June 2011.

A.K. Bolstad, B.D. Van Veen, and R.D. Nowak, "Space-time event sparse penalization for magneto-/electroencephalography," *NeuroImage*, vol. 46, no. 4, pp. 1066-1081, 15 July 2009.

T. Limpiti, **A.K. Bolstad**, B.D. Van Veen, R.T. Wakai, "Detection of cortical patch activity in beamspace using the generalized likelihood ratio test," *International Journal of Bioelectricmagnetism (IJBEM) (Proc. 5th Int. Conf. BEM and NFSI)*, vol. 7, n. 2, May 2005.

Conference Papers

A.F. Ramsey and **A.K. Bolstad**, "A Redirected Learning Architecture for Non-linear Digital Pre-distortion," *2020 IEEE International Conference on Electronics, Circuits and Systems*, 23–25 November 2020.

A.K. Bolstad, J.E. Vian, J.D. Chisum, and Y. Suh, "An Array-based Compressed Sensing Receiver Architecture," *2016 IEEE International Symposium on Phased Array Systems and Technology*, 18–21 October 2016.

M. Burke, K. Gettings, H. Nguyen, J. Muldavin, **A. Bolstad**, M. Vai, and J. Kramer, "Reconfigurable FFT ASIC Accelerators for Sparse and Dense FFT Applications," *Government Microcircuit Applications and Critical Technology Conference (GOMACTech 2015)*, 23–26 March 2015.

C.F. Cull, B.M. Tyrrell, R.P. D'Onofrio, **A.K. Bolstad**, J.H. Lin, J.W. Little, M.H. Blackwell, M. Renzi, and M.W. Kelly, "Smart pixel imaging with computational-imaging arrays," *Proc. of SPIE 9070, Infrared Technology and Applications XL*, 90703D, 1 July 2014.

A. Bolstad, and B.A. Miller, "Sparse Volterra Systems: Theory and Practice," *2013 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 2013.

A. Bolstad, B.A. Miller, K. Gettings, M. Ericson, H. Kim, M. Green, and Dan Santiago, "Sparse Polynomial Equalization of an RF Receiver via Algorithm, Analog, and Digital Codesign," *2012 Conference Record of the Forty Sixth Asilomar Conference on Signals, Systems and Computers (ASILOMAR)*, Nov. 2012.

K. Gettings, **A. Bolstad**, S. Chen, M. Ericson, B.A. Miller, and M. Vai, "Low Power Sparse Polynomial Equalizer (SPEq) for Nonlinear Digital Compensation of an Active Anti-Alias Filter," *2012 IEEE Workshop on Signal Processing Systems (SiPS)*, Oct. 2012.

A. Bolstad, B.A. Miller, J. Goodman, J. Vian, and J. Kalyanam, "Identification and Compensation of Wiener-Hammerstein Systems with Feedback," *2011 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, May 2011.

H. H. Kim, M. Green, B. A. Miller, **A. Bolstad**, D. D. Santiago, "An active filter achieving 43.6-dBm OIP3," *2011 IEEE Radio Frequency Integrated Circuits Symposium (RFIC)*, June 2011.

J. Goodman, B.A. Miller, J. Vian, **A. Bolstad**, J. Kalyanam, and M. Herman, "Physical layer considerations for wideband cognitive radio," *2010 Military Communications Conference (MILCOM)*, Oct.–Nov. 2010.

A. Bolstad, B. Van Veen, and R. Nowak. "Magneto-/Electroencephalography with Space-Time Sparse Priors." *IEEE/SP 14th Workshop on Statistical Signal Processing (SSP)*, Aug. 2007.

J. Goodman, B. Miller, G. Raz, **A. Bolstad**. "Variable Projection and Unfolding in Compressed Sensing." *IEEE/SP 14th Workshop on Statistical Signal Processing (SSP)*, Aug. 2007.

A. Bolstad, B. Van Veen, R. Nowak, and R. Wakai, "An expectation-maximization algorithm for space-time sparsity regularization of the MEG inverse problem," *International Congress Series (Proc. 15th Int'l Conference on Biomagnetism, 2006)*, Volume 1300, Jun. 2007.

A. Bolstad, B. Van Veen, and R. Nowak, "Space-time sparsity regularization for the magnetoencephalography inverse problem," *4th IEEE International Symposium on Biomedical Imaging: From Nano to Macro, 2007*, Apr. 2007.

A. Bolstad, B. Van Veen, and R. Nowak, "Beamforming Detectors with Subspace Side Information," *Proc. 14th Adaptive Sensor Array Processing Workshop (ASAP)*, Jun. 2006.

T. Limpiti, **A.K. Bolstad**, B.D. Van Veen, R.T. Wakai, "Detection of cortical patch activity in beamspace using the generalized likelihood ratio test," *Proc. 5th Int. Conf. BEM and NFSI*, vol. 7, n. 2, May 2005.

Invited Talks

"Nonlinear Predistortion Techniques," *IEEE Boston Microwave Theory and Techniques Society Course: Modern Topics in Power Amplifiers,"* Lexington, MA, USA, Oct. 2016.

"Dictionary of Molecules — Group Sparse Approaches to Brain Network Estimation," *Centre de recherches mathématiques, Université de Montréal Workshop "Dictionary of Atoms: New Trends in Advanced Signal Processing in Functional Brain Imaging,"* Montreal, Québec, Canada, Sep. 2009.

Conference Talks

"An Array-based Compressed Sensing Receiver Architecture," *2016 IEEE International Symposium on Phased Array Systems and Technology*, 18–21 October 2016.

"Space-time sparsity regularization for the magnetoencephalography inverse problem," *4th IEEE International Symposium on Biomedical Imaging: From Nano to Macro, 2007*, Apr. 2007.

"Beamforming Detectors with Subspace Side Information," *Proc. 14th Adaptive Sensor Array Processing Workshop (ASAP)*, Jun. 2006.

Technical Reports

A. Bolstad, R. Elliott, J. Goodman, J. Hall, M. Herman, J. Kalyanam, B. Miller, and J. Vian*,

"Extremely Wideband Adaptive Combat Communications (EXACTCOMM)," MIT Lincoln Laboratory: Lexington, MA, 11 February 2011.

K.W. Forsythe, J.I. Goodman, B.A. Miller, V. Goyal, J. Sun, and **A. Bolstad**, "Compressive Sensor Networks," MIT Lincoln Laboratory: Lexington, MA, 27 March 2009.

* denotes authors in alphabetical order

Project Reports

A.K. Bolstad, M.D. Lockard, Y. Suh, and J.E. Vian, "Array-Based Compressed Sensing Receiver Architecture (ACRA) Prototype: FY16 Line-Supported RF Systems Program," MIT Lincoln Laboratory: Lexington, MA, 7 October 2016 (LSP-168).

A.K. Bolstad, J. Chisum, J.D. Hall, M.D. Lockard, Y. Suh, and J.E. Vian*, "Array-Based Compressed Sensing Receiver Architecture (ACRA) Prototype: FY15 Line-Supported RF Systems Program," MIT Lincoln Laboratory: Lexington, MA, 24 November 2015 (LSP-148).

M.M. Vai, J.I. Kramer, **A.K. Bolstad**, M.J. Burke, K.M. Gettings, H.T. Nguyen, R.I. Khazan, D.M. Utin, A. Mithal, and J.B. Muldavin, "Next Generation Embedded Processor: FY13 Line-Supported Information, Computation, and Exploitation Program," MIT Lincoln Laboratory: Lexington, MA, 18 February 2014 (LSP-83).

A.K. Bolstad, M.E. Grein, T.M. Hancock, P.W. Juodawlkis, W. Loh, C.A. Schwicking, M. Trakimas, and S.S. Yegnanarayanan*, "FY12 Line-Supported Advanced ISR Technologies Program: Pseudorandom Optical Sampling-Enabled Analog-to-Digital Converter," MIT Lincoln Laboratory: Lexington, MA, 17 January 2013 (LSP-63).

* denotes authors in alphabetical order

Patents

A.K. Bolstad, J.E. Vian, and J.D. Chisum, "Method and Apparatus for Array-Based Compressed Sensing," U.S. Patent No.: 10,367,674, Issued July 30, 2019.

B.M. Tyrrell, C.F. Cull, and **A.K. Bolstad**, "Method and Apparatus for On-Chip Per-Pixel Pseudo-Random Time Coded Exposure." U.S. Patent No.: 9,743,024, Issued August 22, 2017.

H. Kim, M. Green, **A. Bolstad**, D. Santiago, M. Ericson, K. Gettings, and B. Miller, "Analog/Digital Co-Design Methodology to Achieve High Linearity and Low Power Dissipation in a Radio Frequency (RF) Receiver." U.S. Patent No. 8,964,901, Issued Feb. 24, 2015.

A. Bolstad, B. Miller, K. Gettings, M. Green, H. Kim, and J. Goodman, "Method and Apparatus for Sparse Polynomial Equalization of RF Receive Chains." U.S. Patent No. 8,958,470, Issued Feb. 17, 2015.

H. Kim, M. Green, B. Miller, **A. Bolstad**, A. Chen and D. Santiago, "Digital Compensation of a Nonlinear System." U.S. Patent No. 8,644,437, Issued Feb. 4, 2014.

Teaching

Electronic Circuits (S 2019, S 2020, F 2021)
Signals and Systems I (S 2019, F 2019, S 2020 (recitation), F 2020, S 2021, F 2021, S 2022)
Introduction to Electrical Engineering and Instrumentation (S 2018, F 2018)
Introduction to AC Circuits and Motors (S 2018)
How to Spy on Everyone (Honors Seminar, F 2018)

Service

Journal Reviewer
IEEE Transactions on Signal Processing

IEEE Transactions on Biomedical Engineering
Machine Learning

Proposal Reviewer
Office of Naval Research