

## **MARK A. DAVENPORT**

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School of Electrical and Computer Engineering  
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### **RESEARCH INTERESTS**

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Signal processing, statistical inference, and machine learning with high-dimensional data  
Low-dimensional models, including sparse, low-rank, manifold, parametric, and other geometric models  
Compressive sensing, low-rank matrix recovery, and the use of optimization for exploiting signal structure

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### **EDUCATION**

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#### **PhD in Electrical and Computer Engineering**

Rice University, December 2010

Advisor: Dr. Richard Baraniuk

Thesis: “Random Observations on Random Observations: Sparse Signal Acquisition and Processing”

*Winner of Budd Award for Best Thesis in School of Engineering*

#### **MS in Electrical and Computer Engineering**

Rice University, May 2007

Advisor: Dr. Richard Baraniuk

Thesis: “Error control for support vector machines”

#### **BSEE in Electrical and Computer Engineering, *cum laude***

Rice University, May 2004

#### **BA in Managerial Studies, *cum laude***

Rice University, May 2004

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### **ACADEMIC POSITIONS**

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#### **Assistant Professor of Electrical and Computer Engineering**

School of Electrical and Computer Engineering, Georgia Institute of Technology, 2012–2017

#### **NSF Mathematical Sciences Postdoctoral Research Fellow**

Statistics Department, Stanford University, 2010–2012

#### **Research Visitor**

Laboratoire Jacques-Louis Lions, Université Pierre et Marie Curie, 2011

#### **Instructor**

Department of Electrical and Computer Engineering, Rice University, 2010

#### **Research Assistant**

Department of Electrical and Computer Engineering, Rice University, 2005–2010

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## SELECTED HONORS AND AWARDS

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Sloan Research Fellowship, 2017  
CETL/BP Junior Faculty Teaching Excellence Award, 2016  
IEEE Signal Processing Society Best Paper Award, 2015  
Information and Inference Best Paper Prize Finalist, 2015  
Richard M. Bass Outstanding Teacher Award, 2015  
Lockheed Dean's Excellence in Teaching Award, 2015  
Georgia Tech Class of 1969 Teaching Fellow, 2014–2015  
AFOSR Young Investigator Award, 2014  
NSF CAREER Award, 2014  
Georgia Institute of Technology Class of 1969 Teaching Fellow, 2014  
LexisNexis Dean's Excellence Award, 2014  
Georgia Institute of Technology Class of 1940 Teaching Effectiveness Award, 2013  
Ralph Budd Award for Best Thesis in the School of Engineering at Rice University, 2011  
NSF Mathematical Sciences Postdoctoral Research Fellowship, 2010  
Hershel M. Rich Outstanding Invention Award, 2007  
Teaching Fellowship, ECE Department, Rice University, 2006–2007  
NSF Graduate Fellowship Honorable Mention, 2005  
Texas Instruments Graduate Fellowship, 2004–2005  
Best Senior Project Award, ECE Department, Rice University, 2004  
Tau Beta Pi, 2004  
Eta Kappa Nu, 2003  
L. J. Walsh Scholarship, 2001–2004

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## PROFESSIONAL ACTIVITIES

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### Editorial Activity

Associate Editor for *IEEE Transactions on Signal Processing* (2016–present)

### Meetings Organized

Symposium on “Randomness and efficient computation in signal processing,” at *IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, 2015.

Mini-symposium on “Finding and exploiting structure in data,” at *2015 SIAM Conference on Applied Linear Algebra*.

Symposium on “Low-dimensional models and optimization in signal processing,” at *2013 IEEE GlobalSIP: Global Conference on Signal and Information Processing*.

Symposium on “Compressive sensing: Sensing sparse phenomena in theory and practice,” at *2013 Annual Meeting of the AAAS*.

Workshop on “Manifolds, Sparsity, and Structured Models: When Can Low-Dimensional Geometry Really Help?” at *Advances in Neural Information Processing Systems (NIPS)*, 2009.

### Technical Program Committee

*International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2017.

*IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, 2015.

*IEEE Signal Processing and Signal Processing Education Workshop (SPW)*, 2015.

Symposium on “Information Processing for Big Data” at *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, 2014.

*IEEE Workshop on Statistical Signal Processing (SSP)*, 2012.

### **University Service**

Faculty Advisor, Opportunity Research Scholars Program, 2015–present

Member, ECE Graduate Student Recruitment Committee, 2013–present

Member, Center for Machine Learning (ML@GT), 2016–present

Member, Center for Signal and Information Processing (CSIP), 2012–present

Panelist, Young Investigator Award Proposal Workshop (ECE, ME), 2016

Faculty Associate, Georgia Tech Grand Challenges Program, 2013–2016

Admissions Panel, Georgia Tech President’s Scholarship Program, 2015

Panelist, NSF CAREER Award Proposal Workshop (GT OSP), 2014 & 2015

Member, ECE Student/Faculty Committee, 2012–2013

Guest Lecturer, ECE 8010 Graduate Research Seminar, 2012

Member, Stating Committee on Student Health Insurance (Rice University), 2006–2010

Graduate Student Mentor (Rice University), 2008–2009

Graduate Student Council (ECE Department, Rice University), 2005–2007

### **Reviewer for the Following Journals**

*Annals of Statistics*

*Applied Computational and Harmonic Analysis*

*Applied Mathematics and Computation*

*Electronic Journal of Statistics*

*Foundations of Computational Mathematics*

*IEEE Journal of Selected Topics in Signal Processing*

*IEEE Signal Processing Letters*

*IEEE Signal Processing Magazine*

*IEEE Transactions on Aerospace and Electronic Systems*

*IEEE Transactions on Communications*

*IEEE Transactions on Computational Imaging*

*IEEE Transactions on Image Processing*

*IEEE Transactions on Instrumentation and Measurement*

*IEEE Transactions on Information Theory*

*IEEE Transactions on Knowledge and Data Engineering*

*IEEE Transactions on Neural Networks*

*IEEE Transactions on Signal Processing*

*Inverse Problems*

*Journal of the Royal Statistical Society: Series B*

*Journal of Complexity*

*Journal of Machine Learning Research*

*Linear Algebra and its Applications*

*Machine Learning*

*Neurocomputing*  
*Pattern Recognition*  
*Pattern Recognition Letters*  
*Physical Communication*  
*Signal Processing*  
*SIAM Journal on Imaging Sciences*  
*SIAM Journal on Numerical Analysis*

### **Reviewer for the Following Conferences**

*Conference on Computational Complexity (CCC)*  
*Conference on Learning Theory (COLT)*  
*European Conference on Signal Processing (EUSIPCO)*  
*IEEE Global Conference on Signal Processing (GlobalSIP)*  
*IEEE Information Theory Workshop (ITW)*  
*IEEE International Conference on Communications (ICC)*  
*IEEE International Conference on Computer Communications (INFOCOM)*  
*IEEE International Symposium on Information Theory (ISIT)*  
*IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*  
*IEEE Signal Processing and Signal Processing Education Workshop (SPW)*  
*IEEE Symposium on Foundations of Computer Science (FOCS)*  
*IEEE Workshop on Statistical Signal Processing (SSP)*  
*International Conference on Machine Learning (ICML)*  
*International Conference on Sampling Theory and Applications (SAMPTA)*  
*Military Communications Conference (MILCOM)*  
*Neural Information Processing Systems (NIPS)*  
*Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS)*

### **Reviewer for the Following Funding Agencies**

*Air Force Office of Scientific Research (AFOSR)*  
*National Science Foundation (NSF)*

### **Professional Societies**

*IEEE (Senior Member), SIAM, AAAS, Tau Beta Pi, Eta Kappa Nu*

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## **RESEARCH SUPPORT**

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Grantor: **Alfred P. Sloan Foundation** (Sloan Research Fellowship)  
Project Title: From measurements to information: Exploiting the structure in data  
Principal Investigator: Mark Davenport  
Dates: September 2017 – September 2019

Grantor: **National Science Foundation**, Division of Civil, Mechanical, and Manufacturing Innovation  
Project Title: An audio-based spatiotemporal system for automated monitoring of construction operations  
Award Number: NSF CMMI-1537261

Principal Investigators: David Anderson, Mark Davenport, and Abbas Rashidi  
Dates: August 2015 – May 2018

Grantor: **IERUS Technologies**

Project Title: Compressive sensing for radar discrimination

Principal Investigators: Mark Davenport, Justin Romberg

Dates: August 2015 – August 2016

Grantor: **National Science Foundation**, Division of Computer and Communication Foundations

Project Title: Subspace matching on the continuum

Award Number: NSF CCF-1409406

Principal Investigators: Mark Davenport, Justin Romberg, and Michael Wakin

Dates: September 2014 – September 2017

Grantor: **Air Force Office of Scientific Research**, Young Investigator Program

Project Title: Solving inference and inverse problems using soft data

Award Number: AFOSR FA9550-14-1-0342

Principal Investigator: Mark Davenport

Dates: September 2014 – September 2017

Grantor: **National Science Foundation**, Division of Computer and Communication Foundations

Project Title: CAREER: Learning from coarse, nonmetric, and incomplete data

Award Number: NSF CCF-1350616

Principal Investigators: Mark Davenport

Dates: May 2014 – May 2019

Grantor: **Naval Research Laboratory**

Project Title: Detecting anomalous signals via low-dimensional geometry

Award Number: NRL N00173-14-2-C001

Principal Investigators: Mark Davenport

Dates: October 2013 – October 2016

Grantor: **National Science Foundation**, Division of Mathematical Sciences

Project Title: Mathematical Sciences Postdoctoral Research Fellowship

Award Number: NSF DMS-1004718

Principal Investigator: Mark Davenport

Dates: September 2010 – June 2012

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## COURSES TAUGHT

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### **Statistical Machine Learning**

ECE 6254, Georgia Institute of Technology

Spring 2015, Spring 2014, Spring 2017

### **Introduction to Probability and Statistics for ECEs**

ECE 3077, Georgia Institute of Technology

Summer 2016, Fall 2015, Summer 2013

### **Introduction to Signal Processing**

ECE 2026, Georgia Institute of Technology  
Fall 2014, Fall 2012

### **Harmonic Analysis for Signal Processing**

ECE 8823a, Georgia Institute of Technology  
Spring 2013

### **Digital Signal Processing**

ELEC 431, Rice University  
Spring 2010

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## **STUDENT SUPERVISION AND ADVISING**

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### **PhD Students**

Niranjana Kannabiran, 2016–present  
Topic: Motion texture synthesis via deep learning  
Co-advised with Irfan Essa

Matthew R. O’Shaughnessy, 2016–present  
Topic: Computational imaging in ultrasound and photoacoustics  
Co-advised with Christopher Rozell

Chieh-Feng Cheng, 2015–present  
Topic: Acoustic monitoring of construction operations  
Co-advised with David Anderson

Santhosh Karnik, 2015–present  
Topic: Subspace models and matching on the continuum

Liangbei Xu, 2014–present  
Topic: Dynamic low-rank matrix recovery

Hongteng Xu, 2013–present  
Topic: Synthesis, analysis, and re-organization of sequential data  
Co-advised with Hongyuan Zha

Andrew K. Massimino, 2012–present  
Topic: Adaptive compressive sensing  
*Algorithms and Randomness Center (ARC) Student Fellowship*

Michael G. Moore, 2012–present  
Topic: Algorithms for and applications of autoregressive multivariate point processes

### **MS Students**

Malik Aqeel Anwar, 2016  
Topic: Hyperspectral compressive sensing

## **Selected Undergraduate Students**

Matthew R. O'Shaughnessy, 2014–2016

Topic: Algorithms for nonmetric triangulation and multidimensional scaling

*President's Undergraduate Research Award (PURA)*

## **Doctoral Committees**

Jun Zou, PhD, Electrical and Computer Engineering, Georgia Institute of Technology, 2016

Advisor: Faramarz Fekri

Thesis: Social computing for personalization and credible information mining using probabilistic graphical models

Adam Charles, PhD, Electrical and Computer Engineering, Georgia Institute of Technology, 2015

Advisor: Christopher Rozell

Thesis: Dynamics and correlations in sparse signal acquisition

*Sigma Xi Best Dissertation Award*

Aurèle Balavoine, PhD, Electrical and Computer Engineering, Georgia Institute of Technology, 2014

Advisors: Justin Romberg and Christopher Rozell

Thesis: Mathematical analysis of a dynamical system for sparse recovery

Nicholas Tzou, PhD, Electrical and Computer Engineering, Georgia Institute of Technology, 2014

Advisor: Abhijit Chatterjee

Thesis: Low-cost sub-Nyquist sampling hardware and algorithm codesign for wideband and high-speed signal characterization and measurement

Hassan Kingravi, PhD, Electrical and Computer Engineering, Georgia Institute of Technology, 2014

Advisor: Patricio Vela

Thesis: Reduced-set methods for improving the training and execution speed of kernel methods

Ali Ahmed, PhD, Electrical and Computer Engineering, Georgia Institute of Technology, 2013

Advisor: Justin Romberg

Thesis: Low-rank matrix recovery: Blind deconvolution and efficient sampling of correlated signals

Salman Asif, PhD, Electrical and Computer Engineering, Georgia Institute of Technology, 2013

Advisor: Justin Romberg

Thesis: Dynamic compressive sensing: Sparse recovery algorithms for streaming signals and video

William Mantzel, PhD, Electrical and Computer Engineering, Georgia Institute of Technology, 2013

Advisor: Justin Romberg

Thesis: Parametric estimation of randomly compressed functions

Han Lun Yap, PhD, Electrical and Computer Engineering, Georgia Institute of Technology, 2012

Advisor: Christopher Rozell

Thesis: Constrained measurement systems of low-dimensional signals

Chenchi Luo, PhD, Electrical and Computer Engineering, Georgia Institute of Technology, 2012

Advisor: James McClellan

Thesis: Non-uniform sampling: Algorithms and architectures

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## PRESS

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### **Rejecta Mathematica**, 2009

*Science, The Economist, Nature.com, USA Today, Chronicle of Higher Education, AMS Math in the Media, Ars Technica, MathDL, Rice News, Seed Magazine, Slashdot*

### **Single-Pixel Camera and Compressive Sensing**, 2006–2008

*Scientific American, SIAM Review, MIT Technology Review, Nature Photonics, New Scientist, The Economist, BBC News, BBC Digital Planet, The Guardian, The Times Online, USA Today, Business Week, Houston Chronicle, NAE Radio Series on Engineering, NPR (KUHF Houston Public Radio), Slashdot Technology Review TR10 Emerging Technologies for 2007*

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## CONSULTING AND INDUSTRIAL EXPERIENCE

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Data Science and Machine Learning Advisor, Mogean, Inc., 2016–present

Technical Consultant, Qualcomm, Inc., 2013–2015

Technical Consultant, HRL, 2013–2015

Technical Consultant, Fulbright and Jaworsky, LLP, 2004–2005

Software Engineer, ViaSat, Inc., 2004

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## JOURNAL PUBLICATIONS

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- S. Karnik, Z. Zhu, M. B. Wakin, J. Romberg, and M. A. Davenport, “The Fast Slepian Transform,” Preprint, November 2016.
- C.-F. Cheng, A. Rashidi, M. A. Davenport, and D. V. Anderson, “Activity recognition of construction equipment using audio signals and support vector machines,” Preprint, October 2016.
- M. A. Davenport, A. K. Massimino, D. Needell, and T. Woolf, “Constrained adaptive sensing,” *IEEE Trans. on Signal Processing*, 64(20), pp. 5437–5449, October 2016.
- M. A. Davenport and J. Romberg, “An overview of low-rank matrix recovery from incomplete observations,” *IEEE J. of Selected Topics in Signal Processing*, 10(4), pp. 608–622, June 2016.
- M. A. Davenport, Y. Plan, E. van den Berg, and M. Wootters, “1-bit matrix completion,” *Information and Inference*, 3(3), pp. 189–223, September 2014.  
*Finalist for Information and Inference Best Paper Prize*
- R. Willett, M. F. Duarte, M. A. Davenport, and R. G. Baraniuk, “Sparsity and structure in hyperspectral imaging: Sensing, reconstruction, and target detection,” *IEEE Signal Processing Magazine*, 31(1), pp. 116–126, January 2014.
- A. Cohen, M. A. Davenport, and D. Leviatan, “On the stability and accuracy of least squares approximations,” *Foundations of Computational Mathematics*, 13(5), pp. 819–834, October 2013.
- M. A. Davenport, D. Needell, and M. B. Wakin, “Signal space CoSaMP for sparse recovery with redundant dictionaries,” *IEEE Trans. on Information Theory*, 59(10), pp. 6820–6829, October 2013.
- E. J. Candès and M. A. Davenport, “How well can we estimate a sparse vector?” *Applied and Computational Harmonic Analysis*, 34(2), pp. 317–323, March 2013.
- E. Arias-Castro, E. J. Candès, and M. A. Davenport, “On the fundamental limits of adaptive sensing,” *IEEE Trans. on Information Theory*, 59(1), pp. 472–481, January 2013.



- M. A. Davenport and M. B. Wakin, "Compressive sensing of analog signals using discrete prolate spheroidal sequences," *Applied and Computational Harmonic Analysis*, 33(3), pp. 438–472, November 2012.
- M. A. Davenport, J. N. Laska, J. R. Treichler, and R. G. Baraniuk, "The pros and cons of compressive sensing for wideband signal acquisition: Noise folding vs. dynamic range," *IEEE Trans. on Signal Processing*, 60(9) pp. 4628–4642, September 2012.
- J. N. Laska, P. T. Boufounos, M. A. Davenport, and R. G. Baraniuk, "Democracy in action: Quantization, saturation, and compressive sensing," *Applied and Computational Harmonic Analysis*, 31(3) pp. 429–443, November 2011.
- M. A. Davenport, C. Hegde, M. F. Duarte, and R. G. Baraniuk, "Joint manifolds for data fusion," *IEEE Trans. on Image Processing*, 19(10) pp. 2580–2594, October 2010.
- M. A. Davenport, R. G. Baraniuk, and C. D. Scott, "Tuning support vector machines for minimax and Neyman-Pearson classification," *IEEE Trans. on Pattern Analysis and Machine Intelligence*, 32(10) pp. 1888–1898, October 2010.
- M. A. Davenport and M. B. Wakin, "Analysis of orthogonal matching pursuit using the restricted isometry property," *IEEE Trans. on Information Theory*, 56(9) pp. 4395–4401, September 2010.
- M. A. Davenport, P. T. Boufounos, M. B. Wakin, and R. G. Baraniuk, "Signal processing with compressive measurements," *IEEE J. of Selected Topics in Signal Processing*, 4(2) pp. 445–460, April 2010. *Winner of IEEE Signal Processing Society Best Paper Award*
- R. G. Baraniuk, M. A. Davenport, R. A. DeVore, and M. B. Wakin, "A simple proof of the restricted isometry property for random matrices," *Constructive Approximation*, 28(3) pp. 253–263, December 2008.
- M. F. Duarte, M. A. Davenport, D. Takhar, J. N. Laska, T. Sun, K. F. Kelly, and R. G. Baraniuk, "Single-pixel imaging via compressive sampling," *IEEE Signal Processing Magazine*, 25(2) pp. 83–91, March 2008.
- C. D. Scott and M. A. Davenport, "Regression level set estimation via cost-sensitive classification," *IEEE Trans. on Signal Processing*, 55(6) pp. 2752–2757, June 2007.

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## CONFERENCE PUBLICATIONS

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- C. F. Cheng, A. Rashidi, M. A. Davenport, D. V. Anderson, and C. A. Sabillon, "Acoustical modeling of construction jobsites: Hardware and software requirements," to appear in *Proc. Int. Work. On Computing in Civil Engineering (IWCCE)*, Seattle, Washington, June 2017.
- A. K. Massimino and M. A. Davenport, "The geometry of random paired comparisons," to appear in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)*, New Orleans, Louisiana, March 2017.
- Z. Zhu, S. Karnik, M. B. Wakin, M. A. Davenport, and J. K. Romberg, "Fast orthogonal approximations of sampled sinusoids and bandlimited signals," to appear in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)*, New Orleans, Louisiana, March 2017.
- S. Karnik, Z. Zhu, M. B. Wakin, J. K. Romberg, and M. A. Davenport, "Fast computations for approximation and compression in Slepian spaces," in *Proc. IEEE. Global Conf. on Signal and Information Processing (GlobalSIP)*, Washington D. C., December 2016.
- L. Xu and M. A. Davenport, "Dynamic matrix recovery from incomplete observations under an exact low-rank constraint," in *Proc. Advances in Neural Information Processing Systems (NIPS)*, Barcelona, Spain, December 2016.

- M. R. O'Shaughnessy and M. A. Davenport, "Localizing users and items from paired comparisons," in *Proc. IEEE Int. Work. on Machine Learning for Signal Processing (MLSP)*, Vietri sul Mare, Salerno, Italy, September 2016.
- M. G. Moore and M. A. Davenport, "Analysis of wireless networks using Hawkes processes," in *Proc. IEEE Int. Work. on Signal Processing Advances in Wireless Communications (SPAWC)*, Edinburgh, Scotland, July 2016.
- C-F. Cheng, A. Rashidi, M. A. Davenport, and D. Anderson, "Audio signal processing for activity recognition of construction heavy equipment," in *Proc. Int. Symp. on Automation and Robotics in Construction (ISARC)*, Auburn, Alabama, July 2016.
- A. K. Massimino and M. A. Davenport, "Binary stable embedding via paired comparisons," in *Proc. IEEE Work. on Statistical Signal Processing (SSP)*, Palma de Mallorca, Spain, June 2016.
- M. G. Moore and M. A. Davenport, "A Hawkes' eye view of network information flow," in *Proc. IEEE Work. on Statistical Signal Processing (SSP)*, Palma de Mallorca, Spain, June 2016.
- M. G. Moore, A. K. Massimino, and M. A. Davenport, "Randomized multi-pulse time-of-flight mass spectrometry," in *Proc. IEEE Int. Work. on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, Cancun, Mexico, December 2015.
- M. A. Davenport, A. K. Massimino, D. Needell, and T. Woolf, "Constrained adaptive sensing," in *Proc. Work. on Signal Processing with Adaptive Sparse Structured Representations (SPARS)*, Cambridge, United Kingdom, July 2015.
- M. G. Moore and M. A. Davenport, "Learning network structure via Hawkes processes," in *Proc. Work. on Signal Processing with Adaptive Sparse Structured Representations (SPARS)*, Cambridge, United Kingdom, July 2015.
- H. Xu, H. Zha, and M. A. Davenport, "Active manifold learning via Gershgorin circle guided sample selection," in *Proc. AAAI Conf. on Artificial Intelligence (AAAI-15)*, Austin, Texas, January 2015.
- H. Xu, H. Zha, and M. A. Davenport, "Manifold based dynamic texture synthesis from extremely few samples," in *Proc. IEEE Conf. on Computer Vision and Pattern Recognition (CVPR)*, Columbus, Ohio, June 2014.
- M. A. Davenport, "Lost without a compass: Nonmetric triangulation and landmark multidimensional scaling," in *Proc. IEEE Int. Work. on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, Saint Martin, December 2013.
- A. K. Massimino and M.A. Davenport, "One-bit matrix completion for pairwise comparison matrices," in *Proc. Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS)*, Lausanne, Switzerland, July 2013.
- M. G. Moore and M. A. Davenport, "Orthogonal matching pursuit with dictionary refinement for multitone signal recovery," in *Proc. Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS)*, Lausanne, Switzerland, July 2013.
- M. Wootters, Y. Plan, M. A. Davenport, and E. van den Berg, "Lower bounds for quantized matrix completion," in *Proc. IEEE Int. Symp. on Information Theory (ISIT)*, Istanbul, Turkey, July 2013.
- A. Charles, A. Ahmed, A. Joshi, S. Conover, C. Turnes, and M. A. Davenport, "Cleaning up toxic waste: Removing nefarious contributions to recommendation systems," in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)*, Vancouver, Canada, May 2013.
- M. A. Davenport, D. Needell, and M. B. Wakin, "CoSaMP with redundant dictionaries," in *Proc. 46<sup>th</sup> Asilomar Conf. on Signals, Systems and Computers*, Pacific Grove, California, November 2012.
- M. A. Davenport and E. Arias-Castro, "Compressive binary search," in *Proc. IEEE Int. Symp. on Information Theory (ISIT)*, Cambridge, Massachusetts, July 2012.

- S. R. Schnelle, J. P. Slavinsky, P. T. Boufounos, M. A. Davenport, and R. G. Baraniuk, "A compressive phase-locked loop," in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)*, Kyoto, Japan, March 2012.
- L. Xu, M. A. Davenport, M. A. Turner, T. Sun, and K. F. Kelly, "Compressive Echelle spectroscopy," in *Proc. Unconventional Imaging and Wavefront Sensing VII at SPIE Optics & Photonics*, San Diego, California, August 2011.
- J. R. Treichler, M. A. Davenport, J. N. Laska, and R. G. Baraniuk, "Dynamic range and compressive sensing acquisition receivers," in *Proc. 7<sup>th</sup> U.S. / Australia Joint Workshop on Defense Applications of Signal Processing (DASP)*, Coolumb, Australia, July 2011.
- M. A. Davenport and M. B. Wakin, "Reconstruction and cancellation of sampled multiband signals using discrete prolate spheroidal sequences," in *Proc. Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS)*, Edinburgh, Scotland, June 2011.
- J. P. Slavinsky, J. N. Laska, M. A. Davenport, and R. G. Baraniuk, "The compressive multiplexer for multi-channel compressive sensing," in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)*, Prague, Czech Republic, May 2011.
- M. A. Davenport, C. Hegde, M. F. Duarte, and R. G. Baraniuk, "High-dimensional data fusion via joint manifold learning," in *Proc. AAAI Fall 2010 Symp. on Manifold Learning*, Arlington, Virginia, November 2010.
- M. A. Davenport, S. R. Schnelle, J. P. Slavinsky, R. G. Baraniuk, M. B. Wakin, and P. T. Boufounos, "A wideband compressive radio receiver," in *Proc. Military Communications Conf. (MILCOM)*, San Jose, California, October 2010.
- S. R. Schnelle, J. N. Laska, C. Hegde, M. F. Duarte, M. A. Davenport, and R. G. Baraniuk, "Texas Hold 'Em algorithms for distributed compressive sensing," in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)*, Dallas, Texas, March 2010.
- M. A. Davenport and R. G. Baraniuk, "Sparse geodesic paths," in *Proc. AAAI Fall 2009 Symp. on Manifold Learning*, Arlington, Virginia, November 2009.
- J. N. Laska, M. A. Davenport, and R. G. Baraniuk, "Exact signal recovery from sparsely corrupted measurements through the pursuit of justice," in *Proc. 43<sup>rd</sup> Asilomar Conf. on Signals, Systems and Computers*, Pacific Grove, California, November 2009.
- J. R. Treichler, M. A. Davenport, and R. G. Baraniuk, "Application of compressive sensing to the design of wideband signal acquisition receivers," in *Proc. 6<sup>th</sup> U.S. / Australia Joint Workshop on Defense Applications of Signal Processing (DASP)*, Lihue, Hawaii, September 2009.
- M. A. Davenport, P. T. Boufounos, and R. G. Baraniuk, "Compressive domain interference cancellation," in *Proc. Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS)*, Saint-Malo, France, April 2009.
- M. A. Davenport, C. Hegde, M. B. Wakin, and R. G. Baraniuk, "Manifold-based approaches for improved classification," *NIPS Workshop on Topology Learning*, Whistler, Canada, December 2007.
- C. Hegde, M. A. Davenport, M. B. Wakin, and R. G. Baraniuk, "Efficient machine learning using random projections," *NIPS Workshop on Efficient Machine Learning*, Whistler, Canada, December 2007.
- M. F. Duarte, M. A. Davenport, M. B. Wakin, J. N. Laska, D. Takhar, K. F. Kelly, and R. G. Baraniuk, "Multiscale random projections for compressive classification," in *Proc. IEEE Int. Conf. on Image Processing (ICIP)*, San Antonio, Texas, September 2007.
- M. A. Davenport, R. G. Baraniuk, and C. D. Scott, "Minimax support vector machines," in *Proc. IEEE Workshop on Statistical Signal Processing (SSP)*, Madison, Wisconsin, August 2007.

- M. A. Davenport, M. F. Duarte, M. B. Wakin, J. N. Laska, D. Takhar, K. F. Kelly, and R. G. Baraniuk, "The smashed filter for compressive classification and target recognition," in *Proc. Computational Imaging V at SPIE Electronic Imaging*, San Jose, California, January 2007.
- M. A. Davenport, R. G. Baraniuk, and M. B. Wakin, "Scalable inference and recovery from compressive measurements," *NIPS Workshop on Novel Applications of Dimensionality Reduction*, Whistler, Canada, December 2006.
- M. A. Davenport, R. G. Baraniuk, and C. D. Scott, "Learning minimum volume sets with support vector machines," in *Proc. IEEE Int. Workshop on Machine Learning for Signal Processing (MLSP)*, Maynooth, Ireland, September 2006.
- M. A. Davenport, R. G. Baraniuk, and C. D. Scott, "Controlling false alarms with support vector machines," in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)*, Toulouse, France, May 2006.
- M. F. Duarte, M. A. Davenport, M. B. Wakin, and R. G. Baraniuk, "Sparse signal detection from incoherent projections," in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)*, Toulouse, France, May 2006.

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## BOOKS AND BOOK CHAPTERS

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- M. A. Davenport, M. F. Duarte, Y. C. Eldar, and G. Kutyniok, "Introduction to compressed sensing," in *Compressed Sensing: Theory and Applications*, Cambridge University Press, 2012. [amzn.to/KdvNIW]
- R. G. Baraniuk, M. A. Davenport, M. F. Duarte, and C. Hegde. *An Introduction to Compressive Sensing*. Connexions e-textbook, 2011. [cnx.org/content/col11133]

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## SELECTED REPORTS

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- M. A. Davenport, J. N. Laska, P. T. Boufounos, and R. G. Baraniuk, "A simple proof that random matrices are democratic," Rice University ECE Technical Report TREE 0906, November 2009.
- M. A. Davenport, C. Hegde, M. F. Duarte, and R. G. Baraniuk, "A theoretical analysis of joint manifolds," Rice University ECE Technical Report TREE 0901, January 2009.
- M. A. Davenport, M. B. Wakin, and R. G. Baraniuk, "Detection and estimation with compressive measurements," Rice University ECE Technical Report TREE 0610, November 2006.
- M. A. Davenport, "The  $2\nu$ -SVM: A cost-sensitive extension of the  $\nu$ -SVM," Rice University ECE Technical Report TREE 0504, October 2005.

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## PATENTS

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- R. G. Baraniuk, P. T. Boufounos, and M. A. Davenport, "Method and Apparatus for Compressive Domain Filtering and Interference Cancellation." US Patent No. 8,725,784. Issued May 13, 2014.
- R. G. Baraniuk, D. Z. Baron, M. F. Duarte, M. Elnozahi, M. B. Wakin, M. A. Davenport, J. N. Laska, J. A. Tropp, Y. Massoud, S. Kirolos, T. Ragheb, "Method and Apparatus for On-Line Compressed Sensing." US Patent No. 8,687,689. Issued April 1, 2014
- R. G. Baraniuk, P. T. Boufounos, S. R. Schnelle, M. A. Davenport, and J. N. Laska, "Method and Apparatus for Compressive Parameter Estimation and Tracking." US Patent No. 8,566,053. Issued October 22, 2013.

- R. G. Baraniuk, J. N. Laska, P. T. Boufounos, and M. A. Davenport, "A Method and Apparatus for Automatic Gain Control for Nonzero Saturation Rates." US Patent No. 8,487,796. Issued July 16, 2013.
- R. G. Baraniuk, M. F. Duarte, M. A. Davenport, and M. B. Wakin, "Method and Apparatus for Signal Detection, Classification and Estimation from Compressive Measurements." US Patent No. 8,483,492. Issued July 9, 2013.
- R. G. Baraniuk, J. N. Laska, P. T. Boufounos, and M. A. Davenport, "A Method and Apparatus for Signal Reconstruction from Saturated Measurements." US Patent No. 8,456,345. Issued June 4, 2013.
- R. G. Baraniuk, D. Z. Baron, M. F. Duarte, S. Sarvotham, M. B. Wakin, and M. A. Davenport, "Method and Apparatus for Distributed Compressed Sensing." US Patent No. 7,511,643. Issued March 31, 2009.
- R. G. Baraniuk, D. Z. Baron, M. F. Duarte, S. Sarvotham, M. B. Wakin, and M. A. Davenport, "Method and Apparatus for Distributed Compressed Sensing." US Patent No. 7,271,747. Issued September 18, 2007.

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## OPINION PIECES

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- M. A. Davenport, J. N. Laska, C. J. Rozell, and M. B. Wakin, "The Way I See It: The Lessons of Rejection Shouldn't be Overlooked." Rice University News, July 15, 2009.

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## INVITED PRESENTATIONS

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- "Localization via paired comparisons and nonmetric multidimensional scaling," *Department of Electrical and Computer Engineering, University of Washington*, Seattle, Washington, August 2016.
- "Localization and nonmetric multidimensional scaling via paired comparisons," *Simons Institute Workshop on Real-Time Decision Making*, Berkeley, California, June 2016.
- "Localization from paired comparisons," *Conference on Information Sciences and Systems (CISS)*, Princeton, New Jersey, March 2016.
- "1-bit matrix completion," *Information and Inference Best Paper Prize Meeting*, Oxford, United Kingdom, August 2015.
- "Constrained adaptive sensing," *ISI World Statistics Congress*, Rio de Janeiro, Brazil, July 2015.
- "Localization via paired comparisons," *ShanghaiTech Symposium on Data Science*, Shanghai, China, June 2015.
- "Adaptive sensing for sparse images," *Lorentz Center Workshop on Transformations in Optics*, Leiden, The Netherlands, May 2015.
- "Compressive sensing," *Lorentz Center Workshop on Transformations in Optics*, Leiden, The Netherlands, May 2015.
- "Localization via paired comparisons," *Department of Mathematics, University of Georgia*, Athens, Georgia, March 2015.
- "Localization via paired comparisons," *Department of Statistics, University of Wisconsin*, Madison, Wisconsin, February 2015.
- "Recovery of low-rank matrices from incomplete observations," *Qualcomm Advanced Modem Technology Forum*, San Diego, California, October 2014.
- "Tracking a low-dimensional vector via quantized measurements or pairwise comparisons," *International Conference on Signal Processing and Communications (SPCOM)*, Bangalore, India, July 2014.

“Tracking a low-dimensional vector via quantized measurements or pairwise comparisons,” *Society for Industrial and Applied Mathematics Annual Meeting*, Chicago, Illinois, July 2014.

“Adaptive sensing of sparse signals in noise,” *Bertinoro Workshop on Sublinear Algorithms*, Bertinoro, Italy, May 2014.

“Adaptive sensing for compressive imaging,” *Imaging and Modeling in Electron Microscopy – Recent Advances*, Banff International Research Station, Canada, May 2014.

“1-bit matrix completion,” *SINE Lab, Colorado School of Mines*, Golden, Colorado, October 2013.

“Sparsity and structure in imaging,” *Chester F. Carlson Center for Imaging Science, Rochester Institute of Technology*, Rochester, New York, October 2013.

“1-bit matrix completion,” *Rice University Departments of Computational and Applied Mathematics / Electrical and Computer Engineering*, Houston, Texas, October 2013.

“1-bit matrix completion,” *Center for Control Science and Technology, University of Texas at Dallas*, Dallas, Texas, September 2013.

“1-bit matrix completion,” *European Conference on Numerical Mathematics and Advanced Applications (ENUMATH)*, Lausanne, Switzerland, August 2013.

“1-bit matrix completion,” *Claremont McKenna College Department of Mathematical Sciences*, Claremont, California, May 2013.

“Adaptive envelope estimation of sparse signals,” *Qualcomm Advanced Modem Technology Forum*, San Diego, California, May 2013.

“A compressive introduction to compressive sensing,” *2013 Annual Meeting of the AAAS*, Boston, Massachusetts, February 2013.

“To adapt or not to adapt: The power and limits of adaptive sensing,” *Colorado School of Mines Department of Electrical Engineering and Computer Science*, Golden, Colorado, May 2012.

“To adapt or not to adapt: The power and limits of adaptive sensing,” *Carnegie Mellon University Department of Electrical and Computer Engineering*, Pittsburgh, Pennsylvania, February 2012.

“To adapt or not to adapt: The power and limits of adaptivity for sparse estimation,” *Carnegie Mellon University Department of Statistics*, Pittsburgh, Pennsylvania, February 2012.

“To adapt or not to adapt: The power and limits of adaptive sensing,” *Johns Hopkins University Department of Electrical and Computer Engineering*, Baltimore, Maryland, February 2012.

“To adapt or not to adapt: The power and limits of adaptive sensing,” *Georgia Institute of Technology School of Electrical and Computer Engineering*, Atlanta, Georgia, February 2012.

“To adapt or not to adapt: The power and limits of adaptive sensing,” *Arizona State University School of Electrical, Computer, and Energy Engineering*, Tempe, Arizona, January 2012.

“To adapt or not to adapt: The power and limits of adaptivity for sparse estimation,” *University of North Carolina Department of Statistics and Operations Research*, Chapel Hill, North Carolina, January 2012.

“How well can we estimate a sparse vector?” *Georgia Institute of Technology School of Electrical and Computer Engineering*, Atlanta, Georgia, November 2011.

“How well can we estimate a sparse vector?” *University of Michigan Department of Mathematics*, Ann Arbor, Michigan, October 2011.

“The pros and cons of compressive sensing,” *University of Wisconsin-Madison Department of Electrical and Computer Engineering*, Madison, Wisconsin, October 2011.

“The pros and cons of compressive sensing,” *University of Minnesota Department of Electrical and Computer Engineering*, Minneapolis, Minnesota, October 2011.

- “Compressive sensing in practice: Noise, quantization, and real-world signals,” *Foundations of Computational Mathematics (FoCM): Workshop on Computational Harmonic Analysis, Image, and Signal Processing*, Budapest, Hungary, July 2011.
- “Compressive sensing: Theory and practice,” *IBM Watson Workshop: Emerging Leaders in Multimedia and Signal Processing*, Hawthorne, New York, October 2010.
- “Compressive measurements for signal acquisition and processing,” *University of Texas at Austin Department of Electrical and Computer Engineering*, Austin, Texas, June 2010.
- “Compressive measurements for signal acquisition and processing,” *Princeton University Department of Electrical Engineering*, Princeton, New Jersey, May 2010.
- “Corruption, justice, and democracy in compressive sensing,” *University of Michigan Department of Electrical Engineering and Computer Science*, Ann Arbor, Michigan, March 2010.
- “Corruption, justice, and democracy in compressive sensing,” *Colorado School of Mines Department of Electrical and Computer Engineering*, Golden, Colorado, March 2010.
- “Compressive imaging: Theory and practice,” *Workshop on Imaging in Electron Microscopy II*, Columbia, South Carolina, February 2010.
- “Starting and running an open access journal,” *Scholarly Communications Workshop, Rice University*, Houston, Texas, October 2009.

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## SHORT COURSES AND TUTORIALS

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- “The fundamentals of compressive sensing,” *Department of Electronics and Communication Engineering, National Institute of Technology Karnataka*, Mangalore, India, July 2014.
- “M. A. Davenport, “The Fundamentals of Compressive Sensing.” Three part tutorial on compressive sensing produced for IEEE Signal Processing Society Online Video Library, 2013. [<http://bit.ly/1XkIRjD>]
- “The fundamentals of compressive sensing,” *IEEE Signal Processing Society Summer School on Compressive Sensing and MIMO Signal Processing Systems*, National Tsing-Hua University, Hsinchu, Taiwan, July 2012.
- “Compressive sensing in noise and the role of adaptivity,” *JASON Compressed Sensing Study*, La Jolla, California, June 2012.
- “The fundamentals of compressive sensing,” *JASON Compressed Sensing Study*, La Jolla, California, June 2012.
- “Compressive sensing,” *Course on Sparse Representations, Compressed Sensing, and Machine Learning at US Naval Research Laboratory*, Washington, DC, September 2011. (Part of a 4 day course co-taught with Michael Elad and Yann LeCun)

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## OTHER PRESENTATIONS

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- “The Fast Slepian Transform,” *Information Theory and Applications Workshop (ITA)*, San Diego, California, February 2017.
- “Learning from pairwise comparisons,” *Information Theory and Applications Workshop (ITA)*, San Diego, California, February 2015.
- “Matrix recovery from coarse observations,” *Foundations of Computational Mathematics (FoCM): Workshop on Computational Harmonic Analysis, Image, and Signal Processing*, Montevideo, Uruguay, December 2014.

- “On the power and limits of adaptivity for sparse signal acquisition,” *Georgia Institute of Technology School of Industrial and Systems Engineering Statistics Seminar*, Atlanta, Georgia, October 2014.
- “Matrix completion: How to deal with massively undersampled datasets,” *Georgia Institute of Technology Quantitative Psychology Brown Bag Series*, Atlanta, Georgia, September 2013.
- “1-bit matrix completion,” *Workshop on Signal Processing with Adaptive Sparse Structured Representations (SPARS)*, Lausanne, Switzerland, July 2013.
- “1-bit matrix completion,” *Georgia Institute of Technology School of Industrial and Systems Engineering Statistics Seminar*, Atlanta, Georgia, April 2013.
- “1-bit matrix completion,” *Information Theory and Applications Workshop (ITA)*, San Diego, California, February 2013.
- “1-bit matrix completion,” *Georgia Institute of Technology School of Mathematics Stochastics Seminar*, Atlanta, Georgia, February 2013.
- “Compressive sensing and signal processing,” *Georgia Institute of Technology, ECE 8010*, Atlanta, Georgia, September 2012.
- “A simple framework for analog compressive sensing,” *International Symposium on Mathematical Programming (ISMP)*, Berlin, Germany, August 2012.
- “On the fundamental limits of adaptive sensing,” *Information Theory and Applications Workshop (ITA)*, San Diego, California, February 2012.
- “The limits of adaptive sensing,” *University of California, Berkeley Networking, Communications, and DSP Seminar*, Berkeley, California, December 2011.
- “Corruption, justice, and democracy in compressive sensing,” *Information Theory and Applications Workshop (ITA)*, San Diego, California, January 2010.
- “Sparse geodesic paths,” *NIPS Workshop on Manifolds, Sparsity, and Structured Models: When Can Low-Dimensional Geometry Really Help?* Whistler, Canada, December 2009.
- “Compressive radio receivers,” *Communication Theory Workshop (CTW)*, Napa, California, May 2009.
- “Joint manifold models for collaborative inference,” *Institute for Mathematics and Its Applications Hot Topics Workshop: Multi-Manifold Data Modeling and Applications*, Minneapolis, Minnesota, October 2008.
- “Sparse spectral unmixing,” *Computational Imaging VI at SPIE Electronic Imaging*, San Jose, California, January 2008.
- “Compressive signal processing,” *MADALGO Summer School on Data Stream Algorithms*, Aarhus, Denmark, August 2007.
- “Compressive sensing: A new approach to data acquisition,” *Mitsubishi Electronic Research Labs (MERL)*, Boston, Massachusetts, July 2007.
- “The Johnson-Lindenstrauss lemma meets compressed sensing,” *Sparse Approximation Workshop*, Princeton, New Jersey, November 2006.