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EDUCATION AND ACADEMIC HONORS

University of California, Berkeley, California:

M.S. in Electrical Engineering, May 1995

Project: “Quantized Overcomplete Expansions: Analysis, Synthesis and Algorithms”

Advisor: Martin Vetterli

Ph.D. in Electrical Engineering, December 1998

Thesis: “Beyond Traditional Transform Coding”

Advisor: Martin Vetterli

Eliahu Jury Award (presented to “a graduate student or recent alumnus for outstanding achievement in Systems, Communications, Control, or Signal Processing”) 1998

University of Iowa, Iowa City, Iowa:

B.S.E. with highest distinction, with honors in Electrical Engineering, May 1993

B.S. with highest distinction in Mathematics, May 1993

John Briggs Memorial Award (annual award for the top graduate of the University) 1993

Distinguished Student Leader Certificate 1992

Phi Beta Kappa and Tau Beta Pi inductee

National Science Foundation Graduate Fellowship 1993

National Defense Science and Engineering Graduate Fellowship 1993

Tau Beta Pi Graduate Fellowship 1993

Rhodes Scholarship State Finalist 1992

Barry M. Goldwater Scholarship recipient (250 awarded per year nationally) 1990

POSTGRADUATE RESEARCH AND TEACHING APPOINTMENTS

Senior Software Engineer – Nest (Google/Alphabet). July 2014–present. Contributing to integration of technology from 3dim Tech and a variety of signal processing and machine perception challenges.

Associate Professor – Boston University, Department of Electrical and Computer Engineering. May 2015–present (on leave May 2015–June 2016).

Assistant Professor – Boston University, Department of Electrical and Computer Engineering. January 2014–April 2015 (on leave July 2014–April 2015).

Adviser – 3dim Tech. January 2013–July 2014.

Research Scientist – Massachusetts Institute of Technology, Research Laboratory of Electronics. (Principal Investigator of the Signal Transformation and Information Representation group.) July 2012–March 2016.

Visiting Scholar – Boston University, Department of Electrical and Computer Engineering. September 2013–December 2013.

Esther and Harold E. Edgerton Associate Professor – Massachusetts Institute of Technology, Department of Electrical Engineering and Computer Science. July 2008–June 2012.

Esther and Harold E. Edgerton Assistant Professor – Massachusetts Institute of Technology, Department of Electrical Engineering and Computer Science. July 2007–June 2008.

Assistant Professor – Massachusetts Institute of Technology, Department of Electrical Engineering and Computer Science. January 2004–June 2007.

Visiting Professor – École Polytechnique Fédérale de Lausanne Centre Bernoulli, June–July 2006.

Visiting Scholar – University of California, Berkeley, Department of Electrical Engineering and Computer Sciences. July 2003–December 2003. Sponsor: Prof. Kannan Ramchandran’s Berkeley Audio-Visual Signal Processing and Communication Systems research group.

Senior Research Engineer – Digital Fountain. May 2001–February 2003. Supervisor: Dr. Michael Luby, Co-Founder and Chief Technology Officer. Contributions included design, analysis, simulation and implementation of congestion control mechanisms; assorted other protocol and algorithm designs, including those for a performance enhancing proxy; extensive performance modeling; and competitive analyses.

Member of Technical Staff – Mathematics of Communications Research, Bell Laboratories, Lucent Technologies. September 1998–April 2001. Supervisor: Dr. James Mazo. Research primarily in the general area of source coding and information transmission. Developed several techniques for and applications of multiple description coding, specifically: general theories for multiple description coding with correlating transforms, frame expansions, and lattice vector quantizers; a multiple description version of the Bell Labs Perceptual Audio Coder using lattice vector quantization; and a robust speech coder for long-range cordless telephones using correlating transforms.

OTHER PROFESSIONAL EXPERIENCE

Member of Technical Staff–Level I – Mathematics of Communications Research, Bell Laboratories, Lucent Technologies. June 1997–September 1997. Supervisor: Dr. James Mazo.

Course Consultant – National Technical University. August 1994–December 1995. Consultant for NTU course CA761 Advanced Digital Signal Processing (UC-Berkeley EECS 225A). Assigned and graded homeworks and exams, provided telephone consultation and assigned final grades.

Teaching Assistant – University of Iowa Department of Electrical & Computer Engineering. January 1993–August 1993. Taught discussion sections of a linear systems course. Supervisor: Prof. Soura Dasgupta.

Test Engineering Intern – Norand Corporation, Cedar Rapids, IA. Summer 1992. Designed firmware for test mode of radio controller board and complete production test station (hardware and software).

Electrical Engineering Intern – Norand Corporation, Cedar Rapids, IA. Summer 1991. Designed LCD contrast control circuitry for product and testing equipment for battery evaluation.

HONORS, AWARDS, AND HONORARY MEMBERSHIPS

IEEE Signal Processing Society Magazine Award 2002

National Science Foundation CAREER Award 2007

Elevated to IEEE Fellow (class of 2014) “for contributions to information representations and their applications in acquisition, communication, and estimation”

Best Paper Award, 2014 IEEE International Conference on Image Processing

IEEE Signal Processing Society Distinguished Lecturer, 2017–2018

Phi Beta Kappa (former chapter Vice-President)

Tau Beta Pi (National Engineering and Physics Honor Society)

Eta Kappa Nu (National Electrical Engineering Honor Society)

Sigma Xi (National Scientific Research Honor Society)

Omicron Delta Kappa (National Leadership Honor Society and Service Organization)

AWARDS FOR SUPERVISED RESEARCH AND ENTREPRENEURSHIP

École Polytechnique Fédérale de Lausanne Best Masters Thesis Award 2000, Francois Mason.

IEEE Data Compression Conference Capocelli Prize 2006, L. R. Varshney.

Ernst A. Guillemin Thesis Prize (best MIT SM thesis in electrical engineering) 2006, L. R. Varshney.

David Adler Memorial Prize (best MIT MEng thesis in electrical engineering) 2008, Vinit Misra.

IEEE Data Compression Conference Capocelli Prize 2011, J. Z. Sun.

Jin-Au Kong Award, Honorable Mention (best MIT PhD thesis in electrical engineering) 2011, L. R. Varshney.
IEEE Sensor Array and Multichannel Signal Processing Workshop Student Paper Contest First Prize 2012, J. B. Rhim.

David Adler Memorial Prize (best MIT MEng thesis in electrical engineering), Second Place, 2013, Jonathan B. Mei.

MIT \$100K Entrepreneurship Competition Pitch Contest Grand Prize 2012.

MIT \$100K Entrepreneurship Competition Launch Contest Grand Prize 2013.

MassChallenge 2013 Accelerator Gold Winner.

Jin-Au Kong Award, Honorable Mention (best MIT PhD thesis in electrical engineering) 2015, G. A. Kirmani.

MAJOR PROFESSIONAL SERVICE ACTIVITIES

Image and Multiple Dimensional Signal Processing (IMDSP) Technical Committee, IEEE Signal Processing Society, 2003–2009 (elected position). Associate Member 2012–2013.

Conference Co-Chair 2006–present, SPIE Wavelets and Sparsity conference series.

Editorial Board of Foundations and Trends in Signal Processing, 2006–present.

Scientific Advisory Board of the Banff International Research Station for Mathematical Innovation and Discovery, 2011–present; Programme Committee Member, 2012, 2013.

IEEE Transactions on Multimedia Steering Committee, 2013.

Image, Video, and Multidimensional Signal Processing (IVMSP) Technical Committee, IEEE Signal Processing Society, 2014 (elected position). Committee Vice Chair (elected position) 2014.

Technical Program Co-Chair, 11th International Conference on Sampling Theory and Applications (SampTA 2015).

Computational Imaging Special Interest Group Member, IEEE Signal Processing Society, 2015–present.

Industry Digital Signal Processing (IDSP) Technical Committee, IEEE Signal Processing Society, 2016–2018 (elected position).

SHORT BIOGRAPHY

Vivek K Goyal was born in Waterloo, Iowa. He received the B.S. degree in mathematics and the B.S.E. degree in electrical engineering from the University of Iowa, where he received the John Briggs Memorial Award for the top undergraduate across all colleges. He received the M.S. and Ph.D. degrees in electrical engineering from the University of California, Berkeley, where he received the Eliahu Jury Award for outstanding achievement in systems, communications, control, or signal processing.

He was a Member of Technical Staff in the Mathematics of Communications Research Department of Bell Laboratories, Lucent Technologies, 1998–2001; and a Senior Research Engineer for Digital Fountain, Inc., 2001–2003. He joined the faculty of the Massachusetts Institute of Technology in 2004, where he was the Esther and Harold E. Edgerton Associate Professor of Electrical Engineering and is currently a member principal investigator in the Research Laboratory of Electronics. He is currently an Assistant Professor of Electrical and Computer Engineering with Boston University. His research interests include computational imaging, sampling, quantization, source coding theory, and human decision making.

Dr. Goyal is a member of Phi Beta Kappa, Tau Beta Pi, Sigma Xi, Eta Kappa Nu, SIAM, and EURASIP. He is a Fellow of the IEEE. He was awarded the 2002 IEEE Signal Processing Society Magazine Award and an NSF CAREER Award, and his students have been awarded several thesis and conference best paper awards. He served a six-year term on the IEEE Signal Processing Society's Image and Multiple Dimensional Signal Processing Technical Committee 2003–2009 and is currently serving as Vice Chair of the Image, Video, and Multidimensional Signal Processing Technical Committee. He was a plenary speaker at IEEE Data Compression Conference 2009, IEEE Multimedia Signal Processing Workshop 2009, and EUSIPCO 2012. He is a Technical Program Committee Co-chair of IEEE ICIP 2016, a member of the Scientific Advisory Board of the Banff International Research Station for Mathematical Innovation and Discovery, and a permanent Conference Co-chair of the SPIE Wavelets and Sparsity conference series.

PUBLICATIONS

Books

1. S. G. Chang, M. M. Goodwin, V. K. Goyal, and T. Kalker, “Solution Manual for *Wavelets and Subband Coding* by Martin Vetterli and Jelena Kovačević,” Prentice-Hall, Englewood Cliffs, NJ, 1995.
2. M. Vetterli, J. Kovačević, and V. K. Goyal, *Foundations of Signal Processing*, Cambridge University Press, 2014 (ISBN-10: 110703860X); free version available for download at <http://FoundationsOfSignalProcessing.org>.
3. J. Kovačević, V. K. Goyal, and M. Vetterli, *Fourier and Wavelet Signal Processing*, Cambridge University Press, 2017 (anticipated); free version available for download at <http://FourierAndWavelets.org>.

Volumes edited

1. D. Van de Ville, V. K. Goyal, and M. Papadakis, Eds., “Wavelets XII,” Proceedings of SPIE volume 6701, San Diego, CA, 2007.
2. V. K. Goyal, M. Papadakis, and D. Van de Ville, Eds., “Wavelets XIII,” Proceedings of SPIE volume 7446, San Diego, CA, 2009.
3. M. Papadakis, D. Van de Ville, and V. K. Goyal, Eds., “Wavelets and Sparsity XIV,” Proceedings of SPIE volume 8138, San Diego, CA, 2011.
4. D. Van de Ville, V. K. Goyal, and M. Papadakis, Eds., “Wavelets and Sparsity XV,” Proceedings of SPIE volume 8858, San Diego, CA, 2013.
5. M. Papadakis, V. K. Goyal, and D. Van de Ville, Eds., “Wavelets and Sparsity XVI,” Proceedings of SPIE volume 9597, San Diego, CA, 2015.

Expository articles and book chapters

1. V. K. Goyal, “Theoretical Foundations of Transform Coding,” *IEEE Signal Processing Magazine*, vol. 18, no. 5, pp. 9–21, September 2001.
2. V. K. Goyal, “Multiple Description Coding: Compression Meets the Network,” *IEEE Signal Processing Magazine*, vol. 18, no. 5, pp. 74–93, September 2001.
 - Winner of the 2002 IEEE Signal Processing Society Magazine Award.
3. V. K. Goyal, “Transform Coding,” in *Wiley Encyclopedia of Telecommunications*, J. G. Proakis, Ed., Wiley, 2002, ISBN 0-471-36972-1. See also <http://onlinelibrary.wiley.com/book/10.1002/0471219282> for the on-line edition.
4. V. K. Goyal, A. K. Fletcher, and S. Rangan, “Compressive Sampling and Lossy Compression,” *IEEE Signal Processing Magazine*, vol. 25, no. 2, pp. 48–56, March 2008.
5. V. K. Goyal, A. K. Fletcher, and S. Rangan, “Distributed Coding of Sparse Signals,” in *Distributed Source Coding: Theory, Algorithms and Applications*, P. L. Dragotti and M. Gastpar, eds., Ch. 5, pp. 111–128, Academic Press, 2009.
6. J. B. Rhim, L. R. Varshney, and V. K. Goyal, “Distributed Decision Making by Categorically-Thinking Agents,” in *Decision Making and Imperfection*, T. V. Guy, M. Kárný, and D. H. Wolpert, eds., vol. 474 of Studies in Computational Intelligence, Ch. 2, pp. 37–63, Springer, 2013.
7. A. Kirmani, A. Colaço, and V. K. Goyal, “SFTI: Space-from-Time Imaging,” in *Emerging Technologies for 3D Video: Creation, Coding, Transmission and Rendering*, F. Dufaux, B. Pesquet-Popescu, and M. Cagnazzo, eds., Ch. 2, pp. 17–36, Wiley, 2013.

Journal papers

1. V. K. Goyal, M. Vetterli, and N. T. Thao, “Quantized Overcomplete Expansions in \mathbb{R}^N : Analysis, Synthesis and Algorithms,” *IEEE Trans. Inform. Theory*, vol. 44, no. 1, pp. 16–31, January 1998.
2. V. K. Goyal, “Transform Coding with Integer-to-Integer Transforms,” *IEEE Trans. Inform. Theory*, vol. 46, no. 2, pp. 465–473, March 2000.
3. R. Arean, J. Kovačević, and V. K. Goyal, “Multiple Description Perceptual Audio Coding with Correlating Transforms,” *IEEE Trans. Speech Audio Process.*, vol. 8, no. 2, pp. 140–145, March 2000.
4. V. K. Goyal, J. Zhuang, and M. Vetterli, “Transform Coding with Backward Adaptive Updates,” *IEEE Trans. Inform. Theory*, vol. 46, no. 4, pp. 1623–1633, July 2000.
5. S. Rangan and V. K. Goyal, “Recursive Consistent Estimation with Bounded Noise,” *IEEE Trans. Inform. Theory*, vol. 47, no. 1, pp. 457–464, January 2001.
6. V. K. Goyal, J. Kovačević, and J. A. Kelner, “Quantized Frame Expansions with Erasures,” *Appl. & Comput. Harm. Anal.*, vol. 10, no. 3, pp. 203–233, May 2001.
7. V. K. Goyal and J. Kovačević, “Generalized Multiple Description Coding with Correlating Transforms,” *IEEE Trans. Inform. Theory*, vol. 47, no. 6, pp. 2199–2224, September 2001.
8. V. K. Goyal, S. A. Savari, and W. Wang, “On Optimal Permutation Codes,” *IEEE Trans. Inform. Theory*, vol. 47, no. 7, pp. 2961–2971, November 2001.
9. V. K. Goyal, J. A. Kelner, and J. Kovačević, “Multiple Description Vector Quantization with a Coarse Lattice,” *IEEE Trans. Inform. Theory*, vol. 48, no. 3, pp. 781–788, March 2002.
10. J. Kovačević, P. L. Dragotti, and V. K. Goyal, “Filter Bank Frame Expansions with Erasures,” *IEEE Trans. Inform. Theory*, vol. 48, no. 6, pp. 1439–1450, June 2002.
11. M. Luby, V. K. Goyal, S. Skaria, and G. B. Horn, “Wave and Equation Based Rate Control Using Multicast Round Trip Time,” *Comput. Commun. Rev.*, vol. 32, no. 4, pp. 191–204, October 2002. (This issue of *Comput. Commun. Rev.* is *Proc. ACM SIGCOMM 2002*.)
12. R. Venkataramani, G. Kramer, and V. K. Goyal, “Multiple Description Coding with Many Channels,” *IEEE Trans. Inform. Theory*, vol. 49, no. 9, pp. 2106–2114, September 2003.
13. G. Schuller, J. Kovačević, F. Masson, and V. K. Goyal, “Robust Low-Delay Audio Coding Using Multiple Descriptions,” *IEEE Trans. Speech Audio Process.*, vol. 13, no. 5, pp. 1014–1024, September 2005.
14. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, “Denoising by Sparse Approximation: Error Bounds Based on Rate–Distortion Theory,” *EURASIP J. Appl. Signal Process.*, vol. 2006, Article ID 26318, pp. 1–19, March 2006.
15. A. C. Zelinski, L. L. Wald, K. Setsompop, V. Alagappan, B. A. Gagoski, V. K. Goyal, F. Hebrank, U. Fontius, F. Schmitt, and E. Adalsteinsson, “Comparison of Three Algorithms for Solving Linearized Systems of Parallel Excitation RF Waveform Design Equations: Experiments on an Eight-Channel System at 3 Tesla,” *Concepts in Magnetic Resonance Pt. B*, vol. 31B, no. 3, pp. 176–190, August 2007.
16. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, “Robust Predictive Quantization: Analysis and Design via Convex Optimization,” *IEEE J. Sel. Topics in Signal Process.*, vol. 1, no. 4, pp. 618–632, December 2007.
17. P. Boufounos, A. V. Oppenheim, and V. K. Goyal, “Causal Compensation for Erasures in Frame Representations,” *IEEE Trans. Signal Process.*, vol. 56, no. 3, pp. 1071–1082, March 2008.
18. A. C. Zelinski, L. L. Wald, K. Setsompop, V. Alagappan, B. A. Gagoski, V. K. Goyal, and E. Adalsteinsson, “Fast Slice-Selective Radio-Frequency Excitation Pulses for Mitigating B_1^+ Inhomogeneity in the Human Brain at 7 Tesla,” *Magnetic Resonance in Medicine*, vol. 59, no. 6, pp. 1355–1364, June 2008.
19. J. Kusuma and V. K. Goyal, “Delay Estimation in the Presence of Timing Noise,” *IEEE Trans. Circuits Syst. II–Express Briefs*, vol. 55, no. 9, pp. 848–852, September 2008.
20. A. C. Zelinski, L. L. Wald, K. Setsompop, V. K. Goyal, and E. Adalsteinsson, “Sparsity-Enforced Slice-Selective MRI RF Excitation Pulse Design: Experiments on Single-Channel and Multi-Channel Systems at 7T and 3T,” *IEEE Trans. Medical Imaging*, vol. 27, no. 9, pp. 1217–1229, September 2008.

21. V. Y. F. Tan and V. K. Goyal, "Estimating Signals with Finite Rate of Innovation from Noisy Samples: A Stochastic Algorithm," *IEEE Trans. Signal Process.*, vol. 56, no. 10, pp. 5135–5146, October 2008.
22. A. C. Zelinski, L. M. Angelone, V. K. Goyal, G. Bonmassar, E. Adalsteinsson, and L. L. Wald, "Specific Absorption Rate Studies of the Parallel Transmission of Inner-Volume Excitations at 7T," *J. Magnetic Resonance Imaging*, vol. 28, no. 4, pp. 1005–1018, October 2008.
23. J. Kusuma and V. K. Goyal, "On the Accuracy and Resolution of Powersum-based Sampling Methods," *IEEE Trans. Signal Process.*, vol. 57, no. 1, pp. 182–193, January 2009.
24. B. Jafarpour, V. K. Goyal, D. B. McLaughlin, and W. T. Freeman, "Transform-Domain Sparsity Regularization for Inverse Problems in Geosciences," *Geophysics*, vol. 74, no. 5, pp. R69–R83, September–October 2009.
25. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Necessary and Sufficient Conditions on Sparsity Pattern Recovery," *IEEE Trans. Inform. Theory*, vol. 55, no. 12, pp. 5758–5772, December 2009.
26. B. Jafarpour, V. K. Goyal, D. B. McLaughlin, and W. T. Freeman, "Compressed History Matching: Exploiting Transform-Domain Sparsity for Regularization for Nonlinear Dynamic Data Integration Problems," *Mathematical Geosciences*, vol. 42, no. 1, pp. 1–27, January 2010.
27. A. C. Zelinski, V. K. Goyal, and E. Adalsteinsson, "Simultaneously Sparse Solutions to Linear Inverse Problems with Multiple System Matrices and a Single Observation Vector," *SIAM J. Scientific Computing*, vol. 31, no. 6, pp. 4533–4579, January 2010.
28. A. Deshpande, S. E. Sarma, and V. K. Goyal, "Generalized Regular Sampling of Trigonometric Polynomials and Optimal Sensor Arrangement," *IEEE Signal Process. Lett.*, vol. 14, no. 4, pp. 379–382, April 2010.
29. H. Q. Nguyen, L. R. Varshney, and V. K. Goyal, "Concentric Permutation Source Codes," *IEEE Trans. Communications*, vol. 58, no. 11, pp. 3154–3164, November 2010.
30. D. S. Weller and V. K. Goyal, "On the Estimation of Nonrandom Signal Coefficients From Jittered Samples," *IEEE Trans. Signal Process.*, vol. 59, no. 2, pp. 587–597, February 2011.
31. D. S. Weller and V. K. Goyal, "Bayesian Post-Processing Methods for Jitter Mitigation in Sampling," *IEEE Trans. Signal Process.*, vol. 59, no. 5, pp. 2112–2123, May 2011.
32. H. Q. Nguyen, V. K. Goyal, and L. R. Varshney, "Frame Permutation Quantization," *Appl. & Comput. Harm. Anal.*, vol. 31, no. 1, pp. 74–97, July 2011.
33. V. Misra, V. K. Goyal, and L. R. Varshney, "Distributed Scalar Quantization for Computing: High-Resolution Analysis and Extensions," *IEEE Trans. Inform. Theory*, vol. 57, no. 8, pp. 5298–5325, August 2011.
34. V. K. Goyal, "Scalar Quantization with Random Thresholds," *IEEE Signal Process. Lett.*, vol. 18, no. 9, pp. 525–528, September 2011.
35. A. Kirmani, A. Colaço, F. N. C. Wong, and V. K. Goyal, "Exploiting Sparsity in Time-of-Flight Range Acquisition Using a Single Time-Resolved Sensor," *Optics Express*, vol. 19, no. 22, pp. 21485–21507, October 2011.
 - Top 10 most downloaded paper, January 2012
36. B. Bilgic, V. K. Goyal, and E. Adalsteinsson, "Multi-contrast Reconstruction with Bayesian Compressed Sensing," *Magnetic Resonance in Medicine*, vol. 66, no. 6, pp. 1601–1615, December 2011 (published online 10 Jun 2011).
37. A. Kirmani, H. Jeelani, V. Montazerhodjat, and V. K. Goyal, "Diffuse Imaging: Creating Optical Images with Unfocused Time-Resolved Illumination and Sensing," *IEEE Signal Process. Lett.*, vol. 19, no. 1, pp. 31–34, January 2012 (published in IEEExplore Early Access 31 Oct 2011).
38. S. Rangan, A. K. Fletcher, and V. K. Goyal, "Asymptotic Analysis of MAP Estimation via the Replica Method and Applications to Compressed Sensing," *IEEE Trans. Inform. Theory*, vol. 58, no. 3, pp. 1902–1923, March 2012.
39. J. B. Rhim, L. R. Varshney, V. K. Goyal, "Quantization of Prior Probabilities for Collaborative Distributed Hypothesis Testing," *IEEE Trans. Signal Process.*, vol. 60, no. 9, pp. 4537–4550, September 2012.

40. L. R. Varshney, S. K. Mitter, and V. K. Goyal, "An Information-Theoretic Characterization of Channels That Die," *IEEE Trans. Inform. Theory*, vol. 58, no. 9, pp. 5711–5724, September 2012.
41. S. Feizi, V. K. Goyal, and M. Médard, "Time-Stampless Adaptive Nonuniform Sampling for Stochastic Signals," *IEEE Trans. Signal Process.*, vol. 60, no. 10, pp. 5440–5450, October 2012.
42. D. S. Weller, J. R. Polimeni, L. Grady, L. L. Wald, E. Adalsteinsson, and V. K. Goyal, "Denoising Sparse Images from GRAPPA using the Nullspace Method," *Magnetic Resonance in Medicine*, vol. 68, no. 4, pp. 1176–1189, October 2012 (published online 28 Dec 2011).
43. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Ranked Sparse Signal Support Detection," *IEEE Trans. Signal Process.*, vol. 60, no. 11, pp. 5919–5931, November 2012.
44. U. Kamilov, V. K. Goyal, and S. Rangan, "Message-Passing De-Quantization with Applications to Compressed Sensing," *IEEE Trans. Signal Process.*, vol. 60, no. 12, pp. 6270–6281, December 2012.
45. J. Z. Sun, G. I. Wang, V. K. Goyal, and L. R. Varshney, "A Framework for Bayesian Optimality of Psychophysical Laws," *J. Mathematical Psychology*, vol. 56, no. 6, pp. 495–501, December 2012 (published online 27 Sep 2012).
46. D. S. Weller, J. R. Polimeni, L. Grady, L. L. Wald, E. Adalsteinsson, and V. K. Goyal, "Sparsity-Promoting Calibration for GRAPPA Accelerated Parallel MRI Reconstruction," *IEEE Trans. Medical Imaging*, vol. 32, no. 7, pp. 1325–1335, July 2013.
47. J. Z. Sun, V. Misra, and V. K. Goyal, "Distributed Functional Scalar Quantization Simplified," *IEEE Trans. Signal Process.*, vol. 61, no. 14, pp. 3495–3508, 15 Jul 2013.
48. J. Z. Sun and V. K. Goyal, "Intersensor Collaboration in Distributed Quantization Networks," *IEEE Trans. Communications*, vol. 61, no. 9, pp. 3931–3942, September 2013.
49. S. Kumar, V. K. Goyal, and S. E. Sarma, "Efficient Parametric Signal Estimation from Samples with Location Errors," *IEEE Trans. Signal Process.*, vol. 61, no. 21, pp. 5285–5297, 1 Nov 2013.
50. A. Kirmani, D. Venkatraman, D. Shin, A. Colaço, F. N. C. Wong, J. H. Shapiro, and V. K. Goyal, "First-Photon Imaging," *Science*, vol. 343, no. 6166, pp. 58–61, 3 Jan 2014 (published online 28 Nov 2013).
 - See also the editors' commentary: "This Week in Science: Computing an Image," *Science*, vol. 343, no. 6166, p. 5, 3 Jan 2014.
51. S. Feizi, G. Angelopoulos, V. K. Goyal, and M. Médard, "Backward Adaptation for Power Efficient Sampling," *IEEE Trans. Signal Process.*, vol. 62, no. 16, pp. 4327–4338, 15 Aug 2014 (published online 24 Jun 2014).
52. J. B. Rhim and V. K. Goyal, "Distributed Hypothesis Testing with Social Learning and Symmetric Fusion," *IEEE Trans. Signal Process.*, vol. 62, no. 23, pp. 6298–6308, 1 Dec 2014 (published online 13 Oct 2014).
53. D. Shin, A. Kirmani, V. K. Goyal, and J. H. Shapiro, "Photon-Efficient Computational 3D and Reflectivity Imaging with Single-Photon Detectors," *IEEE Trans. Computational Imaging*, vol. 1, no. 2, pp. 112–125, June 2015 (published online 6 Jul 2015).
54. D. Shin, J. H. Shapiro, and V. K. Goyal, "Single-Photon Depth Imaging Using a Union-of-Subspaces Model," *IEEE Signal Process. Lett.*, vol. 22, no. 12, pp. 2254–2258, December 2015 (published online 1 Sep 2015).
55. D. Shin, F. Xu, F. N. C. Wong, J. H. Shapiro, and V. K. Goyal, "Computational Multi-Depth Single-Photon Imaging," *Optics Express*, vol. 24, no. 3, pp. 1873–1888, February 2016.
56. D. Shin, F. Xu, D. Venkatraman, R. Lussana, F. Villa, F. Zappa, V. K. Goyal, F. N. C. Wong, and J. H. Shapiro, "Photon-Efficient Imaging with a Single-Photon Camera," *Nature Communications*, vol. 7, article no. 12046, 24 June 2016.
 - See also Nature Photonics Research Highlights: D. Pile, "Photon per pixel," *Nature Photonics*, vol. 10, no. 8, p. 498, August 2016.
57. D. Shin, J. H. Shapiro, and V. K. Goyal, "Performance Analysis of Low-Flux Least-Squares Single-Pixel Imaging," *IEEE Signal Process. Lett.*, vol. 23, no. 12, pp. 1756–1760, December 2016.

58. L. R. Varshney, J. Kusuma, and V. K. Goyal, "Malleable Coding for Updatable Cloud Caching," *IEEE Trans. Communications*, vol. 64, no. 12, pp. 4946–4955, December 2016.
59. L. R. Varshney, J. Kusuma, and V. K. Goyal, "On Palimpsests in Neural Memory: An Information Theory Viewpoint," *IEEE Trans. Molecular, Biological, and Multi-Scale Communications*, vol. 2, no. 2, December 2016, to appear.
60. J. Rapp and V. K. Goyal, "A Few Photons Among Many: Unmixing Signal and Noise for Photon-Efficient Active Imaging," submitted to *IEEE Trans. Computational Imaging*, September 2016; arXiv:1609.07407.
61. S. Rangan, A. K. Fletcher, V. K. Goyal, E. Byrne, and P. Schniter, "Hybrid Approximate Message Passing," submitted to *IEEE Trans. Signal Process.*, October 2016.
62. F. Xu, D. Shin, H. Utzat, D. D.-U. Li, R. S. Saleeb, Y. Chen, I. Coropceanu, P. A. Dalgarno, F. N. C. Wong, M. G. Bawendi, V. K. Goyal, J. H. Shapiro, "Computational Fluorescence-Lifetime Imaging Using a Small Number of Photons," submitted for publication, December 2016.

Conference, symposium, and workshop papers

1. V. K. Goyal, M. Vetterli, and N. T. Thao, "Quantization of Overcomplete Expansions," Proc. IEEE Data Compression Conf. 1995 (Snowbird, UT, March 28–30), pp. 13–22.
2. V. K. Goyal and M. Vetterli, "Consistency in Quantized Matching Pursuit," Proc. IEEE Int. Conf. Acoustics, Speech, & Signal Process. 1996 (Atlanta, GA, May 7–10), vol. 3, pp. 1787–1790.
3. V. K. Goyal, M. Vetterli, and N. T. Thao, "Efficient Representations with Quantized Matching Pursuit," Proc. Int. Conf. Analysis & Opt. of Systems 1996 (Paris, France, June 26–28), pp. 305–311.
4. V. K. Goyal, J. Zhuang, M. Vetterli, and C. Chan, "Transform Coding Using Adaptive Bases and Quantization," Proc. IEEE Int. Conf. Image Process. 1996 (Lausanne, Switzerland, September 16–19), vol. II, pp. 365–368.
5. V. K. Goyal and M. Vetterli, "Dependent Coding in Quantized Matching Pursuit," Proc. IS&T/SPIE Visual Comm. & Image Process. 1997 (San Jose, CA, February 12–14), vol. 3024, pt. 1, pp. 2–12.
6. V. K. Goyal, J. Zhuang, and M. Vetterli, "Universal Transform Coding Based On Backward Adaptation," Proc. IEEE Data Compression Conf. 1997 (Snowbird, UT, March 25–27), pp. 231–240.
7. V. K. Goyal and M. Vetterli, "Computation-Distortion Characteristics of Block Transform Coding," Proc. IEEE Int. Conf. Acoustics, Speech, & Signal Process. 1997 (Munich, Germany, April 21–24), vol. 4, pp. 2729–2732.
8. V. K. Goyal and M. Vetterli, "Computation-Distortion Characteristics of JPEG Encoding and Decoding," Proc. 31st Asilomar Conf. Signals, Systems, & Computers 1997 (Pacific Grove, CA, November 2–5), vol. 1, pp. 229–233.
9. V. K. Goyal and J. Kovačević, "Optimal Multiple Description Transform Coding of Gaussian Vectors," Proc. IEEE Data Compression Conf. 1998 (Snowbird, UT, March 30–April 1), pp. 388–397.
10. V. K. Goyal and M. Vetterli, "Block Transform Adaptation By Stochastic Gradient Descent," Proc. IEEE Digital Signal Process. Workshop 1998 (Bryce Canyon, UT, August 9–12).
11. V. K. Goyal, J. Kovačević, and M. Vetterli, "Multiple Description Transform Coding: Robustness to Erasures using Tight Frame Expansions," Proc. IEEE Int. Symp. Inform. Theory 1998 (Cambridge, MA, August 16–21), p. 408.
12. J. Kovačević and V. K. Goyal, "Multiple Descriptions: Source-Channel Coding Methods for Communications," Proc. 10th Tyrrhenian Int. Workshop on Dig. Commun.: Multimedia Commun. (Ischia, Italy, September 16–18, 1998).
13. V. K. Goyal, J. Kovačević, and M. Vetterli, "Quantized Frame Expansions as Source-Channel Codes for Erasure Channels," Proc. Wavelets & Applications Workshop 1998 (Ascona, Switzerland, September 28–October 2).
14. V. K. Goyal, J. Kovačević, R. Arian, and M. Vetterli, "Multiple Description Transform Coding of Images," Proc. IEEE Int. Conf. Image Process. 1998 (Chicago, IL, October 4–7), vol. 1, pp. 674–678.

15. V. K. Goyal and M. Vetterli, "Manipulating Rates, Complexity, and Error-Resilience with Discrete Transforms," Conf. Rec. 32nd Asilomar Conf. Signals, Systems, & Computers (Pacific Grove, CA, November 1–4, 1998), vol. 1, pp. 457–461.
16. V. K. Goyal, J. Kovačević, and M. Vetterli, "Quantized Frame Expansions as Source-Channel Codes for Erasure Channels," Proc. IEEE Data Compression Conf. 1999 (Snowbird, UT, March 29–31), pp. 326–335.
17. J. A. Kelner, V. K. Goyal, and J. Kovačević, "Multiple Description Lattice Vector Quantization: Variations and Extensions," Proc. IEEE Data Compression Conf. 2000 (Snowbird, UT, March 28–30), pp. 480–489.
18. V. K. Goyal, "High-Rate Transform Coding: How High is High, and Does it Matter?" Proc. IEEE Int. Symp. Inform. Theory 2000 (Sorrento, Italy, June 25–30), p. 207.
19. P. L. Dragotti, J. Kovačević, and V. K. Goyal, "Quantized Oversampled Filter Banks with Erasures," Proc. IEEE Data Compression Conf. 2001 (Snowbird, UT, March 27–29), pp. 173–182.
20. R. Venkataramani, G. Kramer, and V. K. Goyal, "Successive Refinement on Trees: A Special Case of a New MD Coding Region," Proc. IEEE Data Compression Conf. 2001 (Snowbird, UT, March 27–29), pp. 293–301.
21. V. K. Goyal, S. A. Savari, and W. Wang, "Optimal Permutation Codes for Uniform Sources," Proc. IEEE Int. Symp. Inform. Theory 2001 (Washington, DC, June 24–29), p. 30.
22. R. Venkataramani, G. Kramer, and V. K. Goyal, "Bounds on the Achievable Region for Certain Multiple Description Coding Problems," Proc. IEEE Int. Symp. Inform. Theory 2001 (Washington, DC, June 24–29), p. 148.
23. V. K. Goyal, "Theorems and Counterexamples in Transform Coding," Proc. DIMACS Workshop on Source Coding & Harmonic Analysis (New Brunswick, NJ, May 8–10, 2002).
24. A. K. Fletcher, K. Ramchandran, and V. K. Goyal, "Recursive Wavelet Denoising," Proc. DIMACS Workshop on Source Coding & Harmonic Analysis (New Brunswick, NJ, May 8–10, 2002).
25. M. Luby, V. K. Goyal, S. Skaria, and G. B. Horn, "Wave and Equation Based Rate Control Using Multicast Round Trip Time," Proc. ACM SIGCOMM 2002 (Pittsburgh, PA, August 19–23). (Listed as journal paper #11.)
26. A. K. Fletcher, K. Ramchandran, and V. K. Goyal, "Wavelet Denoising by Recursive Cycle Spinning," Proc. IEEE Int. Conf. Image Process. 2002 (Rochester, NY, September 22–25), vol. 2, pp. 873–876.
27. A. K. Fletcher, V. K. Goyal, and K. Ramchandran, "Iterative Projective Wavelet Methods for Denoising," Proc. Wavelets X, part of SPIE Int. Symp. Optical Sci. & Tech. 2003 (San Diego, CA, August 3–8), vol. 5207, pp. 9–15.
28. A. K. Fletcher, V. K. Goyal, and K. Ramchandran, "On Multivariate Estimation by Thresholding," Proc. IEEE Int. Conf. Image Process. 2003 (Barcelona, Spain, September 14–17), vol. 1, pp. 61–64.
29. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Estimation from Lossy Sensor Data: Jump Linear Modeling and Kalman Filtering," Proc. Inform. Process. in Sensor Netw. 2004 (Berkeley, CA, April 26–27), pp. 251–258.
30. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, "Robust Predictive Quantization: A New Analysis and Optimization Framework," Proc. IEEE Int. Symp. Inform. Theory 2004 (Chicago, IL, June 27–July 2), p. 427.
31. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, "Optimized Filtering and Reconstruction in Predictive Quantization with Losses," Proc. IEEE Int. Conf. Image Process. 2004 (Singapore, October 24–27), pp. 3245–3248.
32. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Sparse Approximation, Denoising, and Large Random Frames," Proc. Wavelets XI, part of SPIE Optics & Photonics 2005 (San Diego, CA, July 31–August 4), vol. 5914, pp. 172–181.
33. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, "Analysis of Denoising by Sparse Approximation with Random Frame Asymptotics," Proc. IEEE Int. Symp. Inform. Theory 2005 (Adelaide, Australia, September 4–9), pp. 1706–1710.

34. L. R. Varshney and V. K. Goyal, "Ordered and Disordered Source Coding," Proc. Workshop Inform. Theory & its Appl. 2006 (La Jolla, CA, February 6–10).
35. A. K. Fletcher, S. Rangan, V. K. Goyal, and K. Ramchandran, "Causal and Strictly Causal Estimation for Jump Linear Systems: An LMI Analysis," Proc. 40th Conf. Inform. Sci. & Syst. (Princeton, NJ, March 22–24, 2006), pp. 1302–1307.
36. J. Kusuma and V. K. Goyal, "Signal Parameter Estimation in the Presence of Timing Noise," Proc. 40th Conf. Inform. Sci. & Syst. (Princeton, NJ, March 22–24, 2006).
37. L. R. Varshney and V. K. Goyal, "Toward a Source Coding Theory for Sets," Proc. IEEE Data Compression Conf. 2006 (Snowbird, UT, March 28–30), pp. 13–22.
 - Winner of the 2006 Capocelli Prize (best student-authored DCC paper).
38. D. E. Ba and V. K. Goyal, "Nonlinear Transform Coding: Polar Coordinates Revisited," Proc. IEEE Data Compression Conf. 2006 (Snowbird, UT, March 28–30), p. 438.
39. A. C. Zelinski and V. K. Goyal, "Denoising Hyperspectral Imagery and Recovering Junk Bands Using Wavelets and Sparse Approximation," Proc. IEEE Int. Geoscience & Remote Sensing Symp. 2006 (Denver, CO, July 31–August 4), pp. 387–390.
 - Finalist in Student Prize Paper Competition.
40. J. Kusuma and V. K. Goyal, "Multichannel Sampling of Parametric Signals with a Successive Approximation Property," Proc. IEEE Int. Conf. Image Process. 2006 (Atlanta, GA, October 8–11), pp. 1265–1268.
41. L. R. Varshney and V. K. Goyal, "On Universal Coding of Unordered Data," Proc. Workshop Inform. Theory & Appl. 2007 (La Jolla, CA, January 29–February 2), pp. 183–187.
42. A. K. Fletcher, S. Rangan, and V. K. Goyal, "On the Rate-Distortion Performance of Compressed Sensing," Proc. IEEE Int. Conf. Acoustics, Speech, & Signal Process. 2007 (Honolulu, HI, April 15–20), vol. III, pp. 885–888.
43. K. Setsompop, A. C. Zelinski, V. K. Goyal, L. L. Wald, and E. Adalsteinsson, "Sparse Spokes Slice Selective Design for B1 Inhomogeneity Correction at 7T," Proc. Int. Soc. of Magnetic Resonance in Medicine 2007 (Berlin, Germany, May 19–25), p. 356.
44. A. C. Zelinski, V. K. Goyal, L. Angelone, G. Bonmassar, L. L. Wald, and E. Adalsteinsson, "Designing RF Pulses with Optimal Specific Absorption Rate (SAR) Characteristics and Exploring Excitation Fidelity, SAR and Pulse Duration Tradeoffs," Proc. Int. Soc. of Magnetic Resonance in Medicine 2007 (Berlin, Germany, May 19–25), p. 1699.
45. A. C. Zelinski, K. Setsompop, V. K. Goyal, V. Alagappan, U. Fontius, F. Schmitt, L. L. Wald, and E. Adalsteinsson, "Designing Fast 3-D RF Excitations by Optimizing the Number, Placement and Weighting of Spokes in K -Space via a Sparsity-Enforcement Algorithm," Proc. Int. Soc. of Magnetic Resonance in Medicine 2007 (Berlin, Germany, May 19–25), p. 1691.
46. D. E. Ba and V. K. Goyal, "Integer Polar Coordinates for Compression," Proc. IEEE Int. Symp. Inform. Theory 2007 (Nice, France, June 24–29), pp. 1116–1120.
47. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Rate-Distortion Bounds for Sparse Approximation," Proc. IEEE Statist. Signal Process. Workshop 2007 (Madison, WI, August 26–29), pp. 254–258.
48. V. Misra, V. K. Goyal, and L. R. Varshney, "High-Resolution Distributed Functional Quantization," Proc. Workshop Inform. Theory & Appl. 2008 (La Jolla, CA, January 28–February 1), pp. 531–534.
49. A. C. Zelinski, V. K. Goyal, E. Adalsteinsson, and L. L. Wald, "Sparsity in MRI RF Excitation Pulse Design," Proc. 42nd Conf. Inform. Sci. & Syst. (Princeton, NJ, March 19–21, 2008), pp. 252–257.
50. V. Misra, V. K. Goyal, and L. R. Varshney, "High-Resolution Functional Quantization," Proc. IEEE Data Compression Conf. 2008 (Snowbird, UT, March 25–27), pp. 113–122.
51. A. C. Zelinski, K. Setsompop, V. Alagappan, V. K. Goyal, L. L. Wald, and E. Adalsteinsson, "*In Vivo* B_1^+ Inhomogeneity Mitigation at 7 Tesla using Sparsity-Enforced Spatially-Tailored Slice-Selective Excitation Pulses," Proc. Int. Soc. Magnetic Resonance in Medicine 2008 (Toronto, Canada, May 3–9), p. 620.

52. A. C. Zelinski, L. M. Angelone, V. K. Goyal, G. Bonmassar, E. Adalsteinsson, and L. L. Wald, "Specific Absorption Rate Studies of the Parallel Transmission of Inner-Volume Selective Excitations at 7 Tesla," Proc. Int. Soc. Magnetic Resonance in Medicine 2008 (Toronto, Canada, May 3–9), p. 1315.
53. A. C. Zelinski, V. Alagappan, V. K. Goyal, E. Adalsteinsson, and L. L. Wald, "Sparsity-Enforced Coil Array Mode Compression for Parallel Transmission," Proc. Int. Soc. Magnetic Resonance in Medicine 2008 (Toronto, Canada, May 3–9), p. 1302.
54. A. C. Zelinski, V. K. Goyal, L. L. Wald, and E. Adalsteinsson, "Sparsity-Enforced Joint Spiral Trajectory & RF Excitation Pulse Design," Proc. Int. Soc. Magnetic Resonance in Medicine 2008 (Toronto, Canada, May 3–9), p. 1303.
55. A. C. Zelinski, V. K. Goyal, E. Adalsteinsson, and L. L. Wald, "Fast, Accurate Calculation of Maximum Local N-Gram Specific Absorption Rate," Proc. Int. Soc. Magnetic Resonance in Medicine 2008 (Toronto, Canada, May 3–9), p. 1188.
56. A. K. Fletcher, S. Rangan, and V. K. Goyal, "On Subspace Structure in Source and Channel Coding," Proc. IEEE Int. Symp. Inform. Theory 2008 (Toronto, Canada, July 6–11), pp. 1982–1986.
57. B. Jafarpour, V. K. Goyal, and W. T. Freeman, "Reconstruction of Channelized Facies Using Sparsity Constraints," Proc. Soc. Exploration Geophysicists Annual Meeting 2008 (Las Vegas, NV, November 9–14), pp. 1546–1550.
58. A. K. Fletcher, S. Rangan, and V. K. Goyal, "Resolution Limits of Sparse Coding in High Dimensions," Proc. 22nd Conf. Neural Information Process. Syst. (Vancouver, Canada, December 8–10, 2008).
59. D. S. Weller and V. K. Goyal, "Jitter Compensation in Sampling via Polynomial Least Squares Estimation," Proc. IEEE Int. Conf. Acoustics, Speech, and Signal Process. 2009 (Taipei, Taiwan, April 19–24), pp. 3341–3344.
60. J. Z. Sun and V. K. Goyal, "Quantization for Compressed Sensing Reconstruction," Proc. 8th Int. Conf. Sampling Theory and Appl. (Marseille, France, May 18–22, 2009).
61. V. Y. F. Tan and V. K. Goyal, "Estimating Signals With Finite Rate of Innovation From Noisy Samples: A Stochastic Algorithm," Proc. 8th Int. Conf. Sampling Theory and Appl. (Marseille, France, May 18–22, 2009).
62. A. K. Fletcher, S. Rangan, and V. K. Goyal, "A Sparsity Detection Framework for On–Off Random Access Channels," Proc. IEEE Int. Symp. Inform. Theory 2009 (Seoul, Korea, June 28–July 3), pp. 169–173.
63. H. Q. Nguyen, V. K. Goyal, and L. R. Varshney, "On Concentric Spherical Codes and Permutation Codes with Multiple Initial Codewords," Proc. IEEE Int. Symp. Inform. Theory 2009 (Seoul, Korea, June 28–July 3), pp. 2038–2042.
64. J. Z. Sun and V. K. Goyal, "Optimal Quantization of Random Measurements in Compressed Sensing," Proc. IEEE Int. Symp. Inform. Theory 2009 (Seoul, Korea, June 28–July 3), pp. 6–10.
65. L. R. Varshney, J. Kusuma, and V. K. Goyal, "Malleable Coding with Edit-Distance Cost," Proc. IEEE Int. Symp. Inform. Theory 2009 (Seoul, Korea, June 28–July 3), pp. 204–208.
66. A. K. Fletcher, S. Rangan, and V. K. Goyal, "A Sparsity Detection Framework for On–Off Random Access Channels," Proc. Wavelets XIII, part of SPIE Optics & Photonics 2009 (San Diego, CA, August 2–4), pp. 744607-[1–15].
67. L. R. Varshney, S. Mitter, and V. K. Goyal, "Channels That Die," Proc. 47th Ann. Allerton Conf. Commun. Control, and Comput. (Monticello, IL, September 30–October 2, 2009), pp. 566–573.
68. B. Miller, J. Goodman, K. Forsythe, J. Sun, and V. Goyal, "A Multi-Sensor Compressed Sensing Receiver: Performance Bounds and Simulated Results," Conf. Rec. 43rd Asilomar Conf. Signals, Systems, & Computers (Pacific Grove, CA, November 1–4, 2009), pp. 151–1575.
69. S. Rangan, A. K. Fletcher, and V. K. Goyal, "Asymptotic Analysis of MAP Estimation via the Replica Method and Compressed Sensing," Proc. 23rd Ann. Conf. Neural Inform. Process. Syst. (Vancouver, Canada, December 7–9, 2009). (**Spotlight Paper.**)
70. H. Q. Nguyen, V. K. Goyal, and L. R. Varshney, "Frame Permutation Quantization," Proc. of 44th Ann. Conf. Inform. Sciences and Syst. (Princeton, NJ, March 17–19, 2010).

71. D. S. Weller, J. R. Polimeni, L. J. Grady, L. L. Wald, E. Adalsteinsson, and V. K. Goyal, "Combining Nonconvex Compressed Sensing and GRAPPA Using a Nullspace Method," Proc. Int. Soc. Magnetic Resonance in Medicine 2010 (Stockholm, Sweden, May 2–7), paper 4880.
72. S. Rangan, A. K. Fletcher, and V. K. Goyal, "Extension of Replica Analysis to MAP Estimation with Applications to Compressed Sensing," Proc. IEEE Int. Symp. Inform. Theory 2010 (Austin, TX, June 13–18), pp. 1543–1547.
73. S. Feizi, V. K. Goyal, and M. Médard, "Locally Adaptive Sampling," Proc. 48th Ann. Allerton Conf. Commun., Control, and Comput. (Monticello, IL, September 29–October 1, 2010), pp. 152–159.
74. L. R. Varshney, J. B. Rhim, K. R. Varshney, and V. K. Goyal, "Categorical Decision Making by People, Committees, and Crowds," Proc. 2011 Workshop Inform. Theory & Applications (La Jolla, CA, February 6–11).
75. S. Jakubczak, J. Z. Sun, D. Katabi, and V. K. Goyal, "Performance Regimes of Uncoded Linear Communications over AWGN Channels," Proc. 45th Ann. Conf. Inform. Sciences and Syst. (Baltimore, MD, March 23–35, 2011), 6 pages.
76. J. B. Rhim, L. R. Varshney, and V. K. Goyal, "Collaboration in Distributed Hypothesis Testing with Quantized Prior Probabilities," Proc. IEEE Data Compression Conf. 2011 (Snowbird, UT, March 29–31), pp. 303–312.
77. J. B. Rhim, L. R. Varshney, and V. K. Goyal, "Conflict in Distributed Hypothesis Testing with Quantized Prior Probabilities," Proc. IEEE Data Compression Conf. 2011 (Snowbird, UT, March 29–31), pp. 313–322.
78. J. Z. Sun and V. K. Goyal, "Scalar Quantization for Relative Error," Proc. IEEE Data Compression Conf. 2011 (Snowbird, UT, March 29–31), pp. 293–302.
 - Winner of the 2011 Capocelli Prize (best student-authored DCC paper).
79. D. S. Weller, J. R. Polimeni, L. Grady, L. L. Wald, E. Adalsteinsson, and V. K. Goyal, "Evaluating Sparsity Penalty Functions for Combined Compressed Sensing and Parallel MRI," Proc. 8th IEEE Int. Symp. Biomedical Imaging: From Nano to Macro (Chicago, IL, March 30–April 1), pp. 1589–1592.
 - Student Paper Competition Finalist.
80. B. Bilgic, V. K. Goyal, and E. Adalsteinsson, "Joint Bayesian Compressed Sensing for Multi-contrast Reconstruction," Proc. Int. Soc. Magnetic Resonance in Medicine 2011 (Montréal, Canada, May 7–13), p. 71.
81. D. S. Weller, J. R. Polimeni, L. Grady, L. L. Wald, E. Adalsteinsson, and V. Goyal, "SPRING: Sparse Reconstruction of Images using the Nullspace method and GRAPPA," Proc. Int. Soc. Magnetic Resonance in Medicine 2011 (Montréal, Canada, May 7–13), p. 2861.
82. D. S. Weller, J. R. Polimeni, L. Grady, L. L. Wald, E. Adalsteinsson, and V. K. Goyal, "Combined Compressed Sensing and Parallel MRI Compared for Uniform and Random Cartesian Undersampling of k-Space," Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process. 2011 (Prague, Czech Republic, May 22–27), pp. 553–556.
83. U. Kamilov, V. K. Goyal, and S. Rangan, "Message-Passing Estimation from Quantized Samples," Proc. 4th Workshop on Signal Process. with Adaptive Sparse Structured Representations (SPARS 2011) (Edinburgh, United Kingdom, June 27–30), p. 58.
84. U. Kamilov, V. K. Goyal, and S. Rangan, "Optimal Quantization for Compressive Sensing under Message Passing Reconstruction," Proc. 2011 IEEE Int. Symp. Inform. Theory (Saint-Petersburg, Russia, July 31–August 5), pp. 390–394.
85. J. Kusuma, L. R. Varshney, and V. K. Goyal, "Malleable Coding with Fixed Segment Reuse," Proc. 2011 IEEE Int. Symp. Inform. Theory (Saint-Petersburg, Russia, July 31–August 5), pp. 692–696.
86. A. Kirmani, H. Jeelani, V. Montazerhodjat, and V. K. Goyal, "Diffuse Imaging: Replacing Lenses and Mirrors with Omnitemporal Cameras," Proc. Wavelets and Sparsity XIV, part of SPIE Optics & Photonics 2011 (San Diego, CA, August 21–24), 6 pages.
87. D. S. Weller, J. R. Polimeni, L. Grady, L. L. Wald, E. Adalsteinsson, and V. K. Goyal, "Regularizing GRAPPA using Simultaneous Sparsity to Recover De-noised Images," Proc. Wavelets and Sparsity XIV, part of SPIE Optics & Photonics 2011 (San Diego, CA, August 21–24), 9 pages.

88. S. Feizi, G. Angelopoloulos, V. K. Goyal, and M. Médard, "Energy-Efficient Time-Stampless Adaptive Nonuniform Sampling," Proc. IEEE Sensors 2011 Conf. (Limerick, Ireland, October 28–31), Paper 1536, 4 pages.
89. U. Kamilov, V. K. Goyal, and S. Rangan, "Generalized Approximate Message Passing Estimation from Quantized Samples," Proc. 4th Int. Workshop on Computational Advances in Multi-Sensor Adaptive Process. (CAMSAP 2011) (San Juan, Puerto Rico, December 13–16), pp. 365–368.
 - Student Paper Award Finalist.
90. J. B. Rhim, L. R. Varshney, and V. K. Goyal, "Distributed Decision Making by Categorically-Thinking Agents," Proc. NIPS 2011 Workshop on Decision Making with Multiple Imperfect Decision Makers (Sierra Nevada, Spain, December 16), 6 pages.
91. S. Feizi, V. K. Goyal, and M. Médard, "Time-Stampless Adaptive Nonuniform Sampling for Stochastic Signals," Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process. 2012 (Kyoto, Japan, March 25–30), pp. 3809–3812.
92. A. Kirmani, A. Colaço, F. N. C. Wong, and V. K. Goyal, "CoDAC: A Compressive Depth Acquisition Camera Framework," Proc. IEEE Int. Conf. Acoustics, Speech and Signal Process. 2012 (Kyoto, Japan, March 25–30), pp. 5425–5428.
93. D. S. Weller, J. R. Polimeni, L. Grady, L. L. Wald, E. Adalsteinsson, and V. K. Goyal, "Greater Acceleration through Sparsity-Promoting GRAPPA Kernel Calibration," Proc. Int. Soc. Magnetic Resonance in Medicine 2012 (Melbourne, Australia, May 5–11), 1 page.
94. D. Venkatraman, N. D. Hardy, V. Montazerhodjat, F. N. C. Wong, V. K. Goyal, and J. H. Shapiro, "Experimental Comparison of SLM-based Traditional and Computational Ghost Imaging with Compressed Sensing," Proc. CLEO 2012 (San Jose, CA, May 6–11).
95. J. B. Rhim, L. R. Varshney, and V. K. Goyal, "Benefits of Collaboration and Diversity in Teams of Categorically-Thinking Decision Makers," Proc. 7th IEEE Sensor Array and Multichannel Signal Process. Workshop (SAM 2012) (Hoboken, NJ, June 17–20), pp. 181–184.
 - 1st Place in Student Paper Contest.
96. A. Colaço, A. Kirmani, G. A. Howland, J. C. Howell, and V. K. Goyal, "Compressive Depth Map Acquisition Using a Single Photon-Counting Detector: Parametric Signal Processing Meets Sparsity," Proc. IEEE Conf. Computer Vision and Pattern Recognition 2012 (Providence, RI, June 18–20), pp. 96–102.
97. A. Kirmani, A. Colaço, F. N. C. Wong, and V. K. Goyal, "CoDAC: Compressive Depth Acquisition using a Single Time-Resolved Sensor," Proc. OSA Imaging and Applied Optics 2012 (Monterey, CA, June 24–28).
98. S. Rangan, A. K. Fletcher, V. K. Goyal, and P. Schniter, "Hybrid Generalized Approximate Message Passing with Applications to Structured Sparsity," Proc. IEEE Int. Symp. Inform. Theory 2012 (Cambridge, MA, July 1–6), pp. 1241–1245.
99. D. S. Weller, J. R. Polimeni, L. Grady, L. L. Wald, E. Adalsteinsson, and V. K. Goyal, "Accelerated Parallel Magnetic Resonance Imaging Reconstruction Using Joint Estimation with a Sparse Signal Model," Proc. IEEE Statist. Signal Process. Workshop 2012 (Ann Arbor, MI, August 5–8).
100. A. Colaço, A. Kirmani, F. N. C. Wong, and V. K. Goyal, "CoDAC: Compressive Depth Acquisition Using a Single Time-Resolved Sensor," Proc. 39th Int. Conf. & Exhib. on Computer Graphics and Interactive Techniques (SIGGRAPH 2012) (Los Angeles, CA, August 5–9).
 - ACM SIGGRAPH Student Research Competition Finalist.
101. J. Z. Sun and V. K. Goyal, "Chatting in Distributed Quantization Networks," Proc. 50th Ann. Allerton Conf. Commun. Control, and Comput. (Monticello, IL, October 1–5, 2012), pp. 2045–2052.
102. J. B. Rhim and V. K. Goyal, "Keep Ballots Secret: On the Futility of Social Learning in Decision Making by Voting," Proc. IEEE Int. Conf. Acoustics, Speech, & Signal Process. 2013 (Vancouver, BC, Canada, May 26–31), pp. 4231–4235.
103. D. Shin, A. Kirmani, and V. K. Goyal, "Low-Rate Poisson Intensity Estimation Using Multiplexed Imaging," Proc. IEEE Int. Conf. Acoustics, Speech, & Signal Process. 2013 (Vancouver, BC, Canada, May 26–31), pp. 1364–1368.

104. A. Kirmani, D. Venkatraman, A. Colaço, F. N. C. Wong, and V. K. Goyal, “High Photon Efficiency Computational Range Imaging using Spatio-Temporal Statistical Regularization,” Proc. CLEO 2013 (San Jose, CA, June 9–14), paper QF1B.2.
105. A. Colaço, A. Kirmani, N.-W. Gong, T. McGarry, L. Watkins, and V. K. Goyal, “3dim: Compact and Low Power Time-of-Flight Sensor for 3D Capture Using Parametric Signal Processing,” Proc. 2013 Int. Image Sensor Workshop (Snowbird, UT, June 12–16), pp. 349–352.
106. J. B. Rhim and V. K. Goyal, “Social Teaching: Being Informative vs. Being Right in Sequential Decision Making,” Proc. IEEE Int. Symp. Inform. Theory 2013 (Istanbul, Turkey, July 7–12), pp. 2602–2606.
107. J. Z. Sun and V. K. Goyal, “Rate Loss in Distributed Functional Source Coding,” Proc. IEEE Int. Symp. Inform. Theory 2013 (Istanbul, Turkey, July 7–12), pp. 2364–2368.
108. A. Kirmani, A. Colaço, D. Shin, and V. K. Goyal, “Spatio-temporal Regularization for Range Imaging with High Photon Efficiency,” Proc. SPIE Wavelets & Sparsity XV (San Diego, CA, August 26–29, 2013).
109. J. Mei, A. Kirmani, A. Colaço, and V. K. Goyal, “Phase Unwrapping and Denoising for Time-of-Flight Imaging Using Generalized Approximate Message Passing,” Proc. IEEE Int. Conf. Image Process. 2013 (Melbourne, Australia, September 15–18), pp. 364–368.
 - Top 10% award.
110. D. Shin, A. Kirmani, V. K. Goyal, and J. H. Shapiro, “Information in a Photon: Relating Entropy and Maximum-Likelihood Range Estimation Using Single-Photon Counting Detectors,” Proc. IEEE Int. Conf. Image Process. 2013 (Melbourne, Australia, September 15–18), pp. 83–87.
111. A. Colaço, A. Kirmani, H. S. Yang, N.-W. Gong, C. Schmandt, and V. K. Goyal, “Mime: Compact, Low-Power 3D Gesture Sensing for Interaction with Head-Mounted Displays,” Proc. 26th ACM Symp. User Interface Software & Technology (St. Andrews, UK, October 8–11, 2013), pp. 227–236.
112. J. Mei, A. Colaço, A. Kirmani, and V. K. Goyal, “Compact Low-Power 3D Imaging of Simple Planar Scenes Using Parametric Signal Processing,” Conf. Rec. 47th Asilomar Conf. Signals, Systems, & Computers (Pacific Grove, CA, November 3–6, 2013).
113. A. Kirmani, D. Shin, A. Colaço, and V. K. Goyal, “Parametric Poisson Process Imaging,” Proc. 1st IEEE Global Conf. Signal and Information Process., Symp. on New Sensing and Statistical Inference Methods (Austin, TX, December 3–5), pp. 1053–1056.
114. J. B. Rhim and V. K. Goyal, “Social Learning in Team Decision Making,” Proc. Collective Intelligence 2014 (Cambridge, MA, June 10–12).
115. D. Shin, A. Kirmani, V. K. Goyal, and J. H. Shapiro, “Computational 3D and Reflectivity Imaging with High Photon Efficiency,” Proc. IEEE Int. Conf. Image Process. 2014 (Paris, France, October 27–30), pp. 46–50.
 - Best Paper Award.
116. D. Shin, F. Xu, D. Venkatraman, R. Lussana, F. Villa, F. Zappa, V. K. Goyal, F. N. C. Wong, and J. H. Shapiro, “Photon-Efficient Computational Imaging with a Single-Photon Camera,” Proc. OSA Imaging and Applied Optics 2016 (Heidelberg, Germany, July 25–28), to appear.
117. D. Shin, J. H. Shapiro, and V. K. Goyal, “Computational Single-Photon Depth Imaging Without Transverse Regularization,” Proc. IEEE Int. Conf. Image Process. 2016 (Phoenix, AZ, September 25–28), pp. 973–977.

Internet Standard

1. M. Luby and V. K. Goyal, “Wave and Equation Based Rate Control (WEBRC) Building Block,” IETF Network Working Group RFC 3738, April 2004. (Version 0: October 2001. Version 1: March 2002. Version 2: June 2002. Version 3: November 2002. Version 4: December 2002.)

Technical Reports (excluding those substantially identical to papers above)

1. V. K. Goyal, “Quantized Overcomplete Expansions: Analysis, Synthesis and Algorithms,” Univ. of California, Berkeley, EECS Dept. Tech. Memo. No. UCB/ERL M95/57, July 1995.
2. V. K. Goyal and M. Vetterli, “Adaptive Transform Coding Using LMS-like Principal Component Tracking,” École Polytechnique Fédérale de Lausanne Tech. Memo. No. SSC/1998/012, January 1998.
3. V. K. Goyal and M. Vetterli, “New Gradient Algorithms for Karhunen–Loève Basis Tracking,” Bell Labs Tech. Memo. No. BL0112170-990901-18TM, September 1999.
4. V. K. Goyal, “Constant-Rate Server Output in WEBRC,” Digital Fountain Tech. Rep. No. DF2002-03-001, March 2002.
5. M. Luby and V. K. Goyal, “Wave and Equation Based Rate Control Using Multicast Round Trip Time: Extended Report,” Digital Fountain Tech. Rep. No. DF2002-07-001, September 2002.
6. V. K. Goyal, “On WEBRC Wave Design and Server Implementation,” Digital Fountain Tech. Rep. No. DF2002-09-001, September 2002.
7. V. K. Goyal, “Tunable Rate Control in Transporter Fountain: Deviations from WEBRC and Simulating with ns,” Digital Fountain Tech. Rep. No. DF2003-02-001, February 2003.
8. K. W. Forsythe, J. I. Goodman, B. A. Miller, V. Goyal, J. Sun, and A. Bolstad, “Compressive Sensor Networks,” Lincoln Laboratory Project Report CSN-1 (unclassified), March 2009.

arXiv E-Prints (excluding those substantially identical to papers above)

1. L. R. Varshney and V. K. Goyal, “Benefiting from Disorder: Source Coding for Unordered Data,” arXiv:0708.2310 [cs.IT], August 2007.
2. B. I. Erkmén and V. K. Goyal, “Beyond Thresholding: Analysis and Improvements for Deterministic Parameter Estimation,” arXiv:0801.3490 [stat.AP], January 2008. (A mostly expository note.)
3. L. R. Varshney, J. Kusuma, and V. K. Goyal, “Malleable Coding: Compressed Palimpsests,” arXiv:0806.4722 [cs.IT], June 2008.
4. D. S. Weller and V. K. Goyal, “Nonlinear Digital Post-Processing to Mitigating Jitter in Sampling,” arXiv:0809.4244 [stat.AP], September 2008. (Expanded into journal papers 30 and 31.)
5. A. K. Fletcher, S. Rangan, and V. K. Goyal, “On–Off Random Access Channels: A Compressed Sensing Framework,” arXiv:0903.1022 [cs.IT], March 2009.
6. S. Rangan, A. K. Fletcher, V. K. Goyal, and P. Schniter, “Hybrid Approximate Message Passing with Applications to Structured Sparsity,” arXiv:1111.2581 [cs.IT], November 2011.
7. J. B. Rhim and V. K. Goyal, “Keep Ballots Secret: On the Futility of Social Learning in Decision Making by Voting,” arXiv:1212.5855 [cs.IT], December 2012.
8. J. B. Rhim and V. K. Goyal, “Social Teaching: Being Informative vs. Being Right in Sequential Decision Making,” arXiv:1212.6592 [cs.IT], December 2012.

Meeting presentations with no proceedings

1. J. Gifford, V. K. Goyal, M. R. Grenier, L. K. Gross, and S. J. Henley, “The Use of Bootstrapping in Principal Component Analysis,” Special Session on Undergraduate Research at the 1991 Annual Meeting of the Mathematical Association of America.
2. V. K. Goyal, J. Kovačević, and M. Vetterli, “Overcomplete Representations and Robustness to Channel Impairments.” SPIE Wavelet Applications in Signal and Image Processing VII (Denver, CO, July 19–23, 1999).
3. A. K. Fletcher, S. Rangan, and V. K. Goyal, “On Encoding with a Codebook of Subspaces,” 2007 Workshop on Information Theory and Applications (La Jolla, CA, January 29–February 2).

PATENTS

1. V. K. Goyal, "Method and Apparatus for Reduced Complexity Entropy Coding," U.S. Patent no. 6 198 412, issued March 6, 2001 (filed January 20, 1999).
2. R. Arean, V. K. Goyal, and J. Kovačević, "Multiple Description Transform Coding of Audio Using Optimal Transforms of Arbitrary Dimension," U.S. Patent no. 6 253 185, issued June 26, 2001 (filed November 12, 1998).
3. V. K. Goyal, J. Kovačević, and M. Vetterli, "Multiple Description Transform Coding of Images Using Optimal Transforms of Arbitrary Dimension," U.S. Patent no. 6 330 370 issued December 11, 2001 (filed September 30, 1998).
4. V. K. Goyal and J. Kovačević, "Multiple Description Transform Coding Using Optimal Transforms of Arbitrary Dimension," U.S. Patent no. 6 345 125 issued February 5, 2002 (filed February 25, 1998).
5. V. K. Goyal, J. A. Kelner, and J. Kovačević, "Method and Apparatus for Lattice-Structured Multiple Description Vector Quantization," U.S. Patent no. 6 594 627 issued July 15, 2003 (filed March 23, 2000).
6. V. K. Goyal, J. Kovačević, and F. Masson, "Method of Multiple Description Coding of Signals for Wireless Transmission," U.S. Patent no. 6 983 243 issued January 3, 2006 (filed October 27, 2000). European Patent filed October 2, 2001.
7. V. K. Goyal, "Method and Apparatus for Adaptive Signal Processing Involving a Karhunen-Loève Basis," U.S. Patent no. 6 993 477 issued January 31, 2006 (filed June 8, 2000).
8. J. Rasmussen, A. Shokrollahi, S. Lassen, G. B. Horn, V. K. Goyal, B. Dobyms, and M. Luby, "System and Method for Reliably Communicating the Content of a Live Data Stream," U.S. Patent no. 7 249 291 issued July 24, 2007 (filed February 14, 2003).
9. A. C. Zelinski, L. L. Wald, E. Adalsteinsson, V. K. Goyal, and V. Alagappan, "Coil Array Mode Compression for Parallel Transmission Magnetic Resonance Imaging," U.S. Patent no. 8 085 046 issued December 27, 2011 (filed August 28, 2009).
10. A. C. Zelinski, K. Setsompop, E. Adalsteinsson, and V. K. Goyal, "Method for Reducing Maximum Local Specific Absorption Rate in Magnetic Resonance Imaging," U.S. Patent no. 8 148 985 issued April 3, 2012 (filed October 15, 2009).
11. A. C. Zelinski, L. L. Wald, E. Adalsteinsson, and V. K. Goyal, "Method for Joint Sparsity-Enforced k -Space Trajectory and Radiofrequency Pulse Design," U. S. Patent no. 8 154 289 issued April 10, 2012 (filed April 13, 2009).
12. D. S. Weller, V. K. Goyal, J. R. Polimeni, and L. Grady, "System for Accelerated MR Image Reconstruction," U. S. Patent no. 8 823 374 issued September 2, 2014 (filed December 15, 2011).
13. V. K. Goyal and G. A. Kirmani, "Method and Apparatus to Determine Depth Information for a Scene of Interest," U. S. Patent no. 8 982 363 issued March 17, 2015 (filed October 5, 2012).
14. S. Feizi-Khankandi, V. K. Goyal, and M. Médard, "Energy-Efficient Time-Stampless Adaptive Nonuniform Sampling," U. S. Patent no. 9 294 113 issued March 22, 2016 (filed July 5, 2012).
15. G. A. Kirmani and V. K. Goyal, "System and Method for Diffuse Imaging with Time-Varying Illumination Intensity," U. S. Patent Application No. 13/572,768, filed August 13, 2012.
16. D. S. Weller, L. J. Grady, L. L. Wald, and V. K. Goyal, "System for Reconstructing MRI Images Acquired in Parallel," U. S. Patent Application No. 13/615,785, filed September 14, 2012.
17. D. S. Weller, L. J. Grady, L. L. Wald, and V. K. Goyal, "System for Accelerated Magnetic Resonance Imaging Using Parallel Coils," U. S. Patent Application No. 13/633,908, filed October 3, 2012.
18. V. K. Goyal and G. A. Kirmani, "Method and Apparatus for 3D Spatial Localization and Tracking of Objects Using Active Optical Illumination and Sensing," U. S. Provisional Patent Application Serial No. 61/597,233, filed February 10, 2013.

FUNDING

| | | | | |
|-------------|---------|-----------|-------------------------|--|
| TI | | \$221 733 | 1 Jan 2005–30 Jun 2013 | Gift funding (many installments) |
| NEC | PI | \$50 000 | 1 Jun 2006–31 May 2007 | Economical Sampling—Slow and Unsteady Can Win the Race |
| NSF 0643836 | PI | \$400 000 | 15 Feb 2007–31 Jan 2012 | CAREER: Acquisition, Approximation, and Compression—An Integrated Study |
| NSF 0729069 | PI | \$285 000 | 15 Sep 2007–31 Aug 2011 | Compressing Unordered Data: Theory, Algorithms, and Applications |
| Lincoln Lab | PI | \$50 000 | 1 Jan 2008–31 Aug 2008 | Compressive Sensor Networking |
| DARPA | Co-PI | \$750 000 | 1 Sep 2010–31 Jul 2013 | Information in a Photon (amount of MIT subcontract from U. Rochester shared with J. Shapiro & F. N. C. Wong) |
| TI | PI | \$50 000 | 15 Apr 2011–31 Dec 2011 | Single-Pixel Time-of-flight Camera for Depth Estimation using Compressed Sensing |
| HP | PI | \$25 000 | 1 May 2011–31 Oct 2011 | Novel 3d Depth Sensors |
| NSF 1101147 | PI | \$328 847 | 1 Jul 2011–30 Jun 2014 | ICES: Small: Decision Making with Bounded Categorization |
| NSF 1115159 | PI | \$368 860 | 1 Aug 2011–31 May 2014 | CIF: Small: Quantization for Acquisition and Computation Networks |
| Siemens | PI | \$97 200 | 1 Jul 2011–31 May 2012 | Accelerated MR Imaging using Multiple Receiver Coils and Sparsity-Based Modeling |
| Qualcomm | | \$100 000 | 1 Sep 2011–31 Aug 2012 | Single Pixel Depth Sensing and 3D Camera (Innovation Fellowship competition) |
| NSF 1161413 | Lead PI | \$750 000 | 1 Apr 2012–31 Mar 2015 | CIF: Medium: Space-from-Time Imaging: Fundamental Limits, Algorithms, and Preliminary Demonstrations |
| Qualcomm | | \$50 000 | 1 Sep 2012–31 Aug 2013 | CoFeCam: Compressive Feature Camera (Innovation Fellowship competition) |
| HP | PI | \$75 000 | 1 Oct 2012–30 Sep 2013 | High-Resolution Compressive Depth Acquisition |
| NSF 1441917 | PI | \$156 840 | 1 Jan 2014–31 Jul 2015 | CIF: Small: Quantization for Acquisition and Computation Networks |
| NSF 1422034 | PI | \$465 189 | 1 Sep 2014–31 Aug 2017 | CIF: Small: Low-Light 3D Imaging: From Fundamental Limits to Practical Systems |
| DARPA | Co-PI | \$699 896 | 26 Jan 2016–25 Jan 2020 | REVEAL: Principles, Limits and Methods for Computational Periscopy (amount of BU subcontract from MIT) |

PRESS COVERAGE

Imaging from Very Little Detected Light

(see journal papers 50 and 56)

- “Stealth camera takes pictures virtually in the dark,” Ron Cowen, *Nature News*, November 28, 2013.
<http://www.nature.com/news/stealth-camera-takes-pictures-virtually-in-the-dark-1.14260>
- “3-D images, with only one photon per pixel: New scheme could enable laser rangefinders to infer depth from a hundredth as much light – and to produce images from only one nine-hundredth the light,” Larry Hardesty, *MIT News*, November 28, 2013.
<http://web.mit.edu/newsoffice/2013/3-d-images-with-one-photon-per-pixel-1128.html>
- “Camera takes 3D photos in the dark,” *BBC News*, December 2, 2013.
<http://www.bbc.com/news/technology-25191171>
- “MIT System Captures 3D Images from the Darkness,” Bryant Jorday, *DefenseTech*, December 2, 2013.
<http://defensetech.org/2013/12/02/mit-system-captures-3d-images-from-the-darkness/>
- “3D Scanners Capture Clear Images in Darkness,” Cabe Atwell, *Design News*, January 2, 2014.
http://www.designnews.com/author.asp?section_id=1386&doc_id=270695
- “Imaging Method Promises to Upgrade Remote Sensing and Microscopy,” Mark Dwortzan, January 27, 2014.
<http://www.bu.edu/ece/2014/01/27/remote-sensing-and-microscopy/>
- “First-photon imaging,” John Swain, *CERN Courier*, February 24, 2014.
<http://cerncourier.com/cws/article/cern/56214>
- “A Point of Light,” Sara Elizabeth Cody, July 7, 2016.
<http://www.bu.edu/ece/2016/07/07/a-point-of-light/>
- “Researchers generate 3D images using just one photon per pixel,” Lisa Zyga, *Phys.org*, July 13, 2016.
<http://phys.org/news/2016-07-3d-images-photon-pixel-video.html>
- “A Point of Light: Vivek Goyal Creates Images from Single Photons,” Sara Cody, *ENGINEER*, Fall 2016 (semiannual publication of the Boston University College of Engineering).
- Additional commentary online at many sites including the following: Gizmodo, Mashable, Nuit Blanche, Phys.org

Low-Power, Low-Cost 3-D Acquisition Systems and Methods

(see journal paper 35 and conference papers 105 and 111)

- “3-D cameras for cellphones: Clever math could enable a high-quality 3-D camera so simple, cheap and power-efficient that it could be incorporated into handheld devices,” Larry Hardesty, *MIT News*, January 5, 2012.
<http://web.mit.edu/newsoffice/2011/lidar-3d-camera-cellphones-0105.html>
- “The MIT \$100K Kicks Off With Superhero Pitches, Awarding an Early \$5,000 To a Mobile 3D Camera,” Lauren Landry, BostInno, October 23, 2012.
<http://bostinno.com/2012/10/23/mit-100k-pitch-contest-recap-and-photos/>
- Press release on MIT \$100K Entrepreneurship Competition Pitch Contest, October 25, 2012.
http://www.mit100k.org/pitch/press_release.php
- “Breakthroughs of 2013: Gesture-Controlled Mobile Phones,” *BBC Focus*, January 2013, p. 35.
<http://tinyurl.com/GoyalFocus>
- “Gesture Is the New Touch: MIT \$100K Entrepreneurship Competition Awards \$100,000 Grand Prize to 3dim, Creator of the First 3-D Gesture Sensor for Mobile Devices,” *The Wall Street Journal Online*, May 16, 2013.
- “Technology to control smartphones by gesture wins MIT \$100K Entrepreneurship prize,” Chris Reidy, *The Boston Globe*, May 16, 2013.
- “Goa girl develops touch-free phone technology,” Gauree Malkarnekar, *The Times of India*, May 22, 2013.
- Additional commentary online at many sites including the following: Wired, Nuit Blanche, Spar Point Group, OutlookSeries, I Programmer, Crazy Engineers, and Next Big Future.

Information Representation in Biological Systems

(see journal paper 45)

- “What number is halfway between 1 and 9? Is it 5 – or 3? A new information-theoretical model of human sensory perception and memory sheds light on some peculiarities of the nervous system,” Larry Hardesty, *MIT News*, October 5, 2012.
<http://web.mit.edu/newsoffice/2012/thinking-logarithmically-1005.html>
- “Does the Brain Work Logarithmically?,” episode of *IEEE Spectrum* Techwise Conversations podcast, November 8, 2012.
<http://spectrum.ieee.org/podcast/biomedical/bionics/does-the-brain-work-logarithmically>
- “Brainstorming,” Emily Ochoa, in Works in Progress column edited by Allen Freeman, *The American Scholar* (print edition), Winter 2013; also online at <http://theamericanscholar.org/works-in-progress-3/>
- “Why do we perceive logarithmically?,” Lav Varshney and John Sun, *Significance*, the bimonthly magazine of the Royal Statistical Society and the American Statistical Association, 10(1):28–31, February 2013.
- Additional commentary online at many sites including the following: ScienceDaily, The Huffington Post, EurekaAlert, R&D Magazine, and TVTechnology.

Magnetic Resonance Imaging

(see journal paper 36)

- “New algorithm could substantially speed up MRI scans: Faster scans could reduce the time patients spend in the machine from 45 to 15 minutes,” Helen Knight, *MIT News*, November 1, 2011.
<http://web.mit.edu/newsoffice/2011/better-mri-algorithm-1101.html>

INVITED PRESENTATIONS

Plenary presentations

1. "Universal Compression of Sparse Sources: Bounds and Improvements," Wavelets and Applications Conference, Bernoulli Center, École Polytechnique Fédérale de Lausanne, July 11, 2006.
2. "Sparse Signal Recovery, Compression, and Communication," IEEE Data Compression Conference, Snowbird, UT, March 16, 2009.
3. "Compressed Sensing: Revisiting Resolution, Modeling, and Computation," IEEE International Workshop on Multimedia Signal Processing, Rio de Janeiro, Brazil, October 7, 2009.
4. "The Optimistic Bayesian: Replica Method Analysis of Compressed Sensing," INSPIRE 2010 Conference on Information Representation and Estimation, University College London, London, UK, September 6, 2010.
5. "Space-from-Time Imaging: Acquiring Reflectance and Depth With Less Optics," 20th European Signal Processing Conference (EUSIPCO 2012), Bucharest, Romania, August 31, 2012.
6. "First-Photon Imaging and Few-Photon Imaging," 6th International Conference on Computing Communications and Networking Technologies (IEEE technically sponsored), Denton, TX, July 13, 2015.
7. "First-Photon Imaging and Other Imaging with Few Photons," 1st Workshop on Sparsity and Compressive Sensing in Multimedia at the IEEE International Conference on Multimedia and Expo, Seattle, WA, July 15, 2016.

Other presentations (without proceedings papers)

1. Univ. of Maryland, College Park, March 16, 1998
2. Univ. of Illinois at Urbana-Champaign, April 9, 1998
3. Purdue Univ., May 4, 1998
4. Univ. of California, San Diego, June 1, 1998
5. Murray Hill Mathematics Research Colloquium, July 15, 1999
6. Murray Hill Mathematics Research Colloquium, October 14, 1999
7. Bell Labs Math Center Research Review, November 12, 1999
8. Princeton Univ. Time-Frequency Brown Bag Seminar, February 29, 2000
9. 34th Conf. Inform. Sciences & Systems, Princeton Univ., March 15, 2000
10. Bell Labs Math Center Research Review, July 21, 2000
11. SPIE Wavelet Applications in Signal and Image Processing VIII, San Diego, CA, August 4, 2000
12. Murray Hill Mathematics Research Colloquium, February 15, 2001
13. Univ. Southern California, February 27, 2001
14. California Inst. of Technology, February 28, 2001
15. Univ. of California, Berkeley, March 1, 2001
16. Univ. of Michigan, March 6, 2001
17. Stanford Univ. Networking Seminar, January 24, 2002
18. Univ. Southern California, April 9, 2002
19. California Inst. of Technology, April 10, 2002
20. École Polytechnique Fédérale de Lausanne, Computer and Communication Sciences Summer Research Institute, July 11, 2002
21. Inst. for Operations Research and Management Sci. (INFORMS) Annual Meeting, San Jose, CA, November 17, 2002
22. École Polytechnique Fédérale de Lausanne, March 18, 2003
23. Stanford Univ., April 3, 2003

24. Univ. California, Los Angeles, April 9, 2003
25. Univ. Washington, April 15, 2003
26. Massachusetts Inst. of Technology, April 24, 2003
27. Carnegie Mellon University, January 29, 2004
28. Texas Instruments' DSP Solutions Research and Development Center, Dallas, TX, May 7, 2004
29. École Polytechnique Fédérale de Lausanne, Computer and Communication Sciences Summer Research Institute, July 14, 2004
30. MIT Stochastic Systems Group Seminar, May 4, 2005
31. École Polytechnique Fédérale de Lausanne, Computer and Communication Sciences Summer Research Institute, July 11, 2005
32. École Polytechnique Fédérale de Lausanne, Laboratoire de Communications Audiovisuelles 10th Anniversary, July 15, 2005
33. Woods Hole Oceanographic Institution, August 31, 2005
34. Analog Devices, Inc., Wilmington, MA, January 13, 2006
35. Banff International Research Station Workshop on Coarsely Quantized Redundant Representations of Signals, March 13, 2006
36. Texas Instruments' DSP Solutions Research and Development Center, Dallas, TX, April 28, 2006
37. SIAM Imaging Science Conference, Minisymposium on Sparse Representations—Theory and Applications in Image Processing, Minneapolis, MN, May 15, 2006
38. École Polytechnique Fédérale de Lausanne, Computer and Communication Sciences Summer Research Institute, July 6, 2006
39. Lincoln Laboratory Embedded Digital Systems Group, Lincoln, MA, December 15, 2006
40. Qualcomm Communication Technologies, San Diego, CA, January 30, 2007
41. IBM T. J. Watson Research Center, Friends of Information Theory Seminar, Yorktown Heights, NY, March 16, 2007
42. Technische Universiteit Delft, The Netherlands, June 19, 2007
43. Shell International Exploration and Production, Rijswijk, The Netherlands, June 21, 2007
44. 6th Int. Congress on Industrial and Applied Mathematics, Zürich, Switzerland, July 17, 2007
45. Challenges in Theoretical and Applied Signal Processing—Sputnik50@EPFL, École Polytechnique Fédérale de Lausanne, October 5, 2007
46. Forschungszentrum Telekommunikation Wien (ftw.) Telecommunications Forum, Vienna, Austria, October 10, 2007
47. Boston University Electrical and Computer Engineering Colloquium, November 7, 2007
48. Cornell University School of Electrical and Computer Engineering Colloquium, November 13, 2007
49. Syracuse University EECS/CASE Colloquium, November 14, 2007
50. 2008 Information Theory and Applications Workshop, University of California, San Diego, January 29, 2008
51. Carnegie Mellon University, February 21, 2008
52. American Institute of Mathematics Workshop on Frames for the Finite World, Palo Alto, CA, August 19, 2008
53. 2009 Information Theory and Applications Workshop, University of California, San Diego, February 10, 2009
54. North Carolina State University Electrical and Computer Engineering Colloquium, February 20, 2009
55. Texas Instruments' DSP Solutions Research and Development Center, Dallas, TX, February 27, 2009
56. MIT Stochastics and Applications Seminar, Cambridge, MA, May 1, 2009

57. École Polytechnique Fédérale de Lausanne, Computer and Communication Sciences Summer Research Institute, June 17, 2009
58. Digital Media Laboratory, Sungkyunkwan University, Suwon, South Korea, June 25, 2009
59. MGH–MIT–Siemens Workshop on Compressed Sensing, Beverly, MA, July 21, 2009
60. Army Research Office Workshop on Challenges in Information Evaluation and Extraction in Distributed Sensing Systems, Cambridge, MA, October 21, 2009
61. Illinois/Missouri Applied Harmonic Analysis Seminar, University of Illinois at Urbana-Champaign, October 16, 2010
62. University of Illinois at Urbana-Champaign Communications Seminar, October 18, 2010.
63. Howard Hughes Medical Institute Janelia Farm Research Campus, Ashburn, VA, November 5, 2010
64. Rice University Electrical and Computer Engineering Texas Instruments Leadership Universities Seminar, November 11, 2010
65. Workshop on Recent Trends in Social Networks: Algorithms, Models and Learning, Tata Institute of Fundamental Research, Mumbai, India, January 5, 2011
66. Banff International Research Station Workshop on Sparse and Low Rank Approximation, March 10, 2011
67. Harvard University Electrical Engineering Seminar Series, April 29, 2011
68. Center for Scientific Computation and Mathematical Modeling–Norbert Wiener Center joint seminar, University of Maryland, College Park, May 4, 2011
69. École Polytechnique Fédérale de Lausanne, Computer and Communication Sciences Summer Research Institute, June 24, 2011
70. Texas Instruments’ DSP Solutions Research and Development Center, Dallas, TX, July 22, 2011
71. 2011 International Workshop on Biomedical and Astronomical Signal Processing Frontiers, Villars, Switzerland, September 7, 2011
72. Rice University Electrical and Computer Engineering Seminar, September 21, 2011.
73. University of Texas Wireless Networking and Communications Seminar, Austin, TX, September 23, 2011
74. University of Wisconsin ECE 600 Departmental Seminar Series, October 3, 2011
75. University of California, Berkeley, Networking, Communications, and DSP Seminar, October 10, 2011
76. University of Southern California, October 12, 2011
77. Cornell University Center for Applied Mathematics Colloquium, Ithaca, NY, November 4, 2011
78. MIT Laboratory for Information and Decision Systems Seminar, Cambridge, MA, November 8, 2011
79. MIT Imaging and Computing Seminar, Cambridge, MA, December 1, 2011
80. Air Force Institute of Technology, Dayton, OH, December 5, 2011
81. 2012 Information Theory and Applications Workshop, San Diego, CA, February 9, 2012
82. Qualcomm Corporate Research, San Diego, CA, February 13, 2012
83. University of California, San Diego, ITA Seminar, San Diego, CA, February 14, 2012
84. Lincoln Laboratory Technology Office Seminar Series, Lincoln, MA, March 6, 2012
85. University of British Columbia, Vancouver, BC, March 7, 2012
86. University of British Columbia, Vancouver, BC, March 8, 2012
87. Johns Hopkins University, Baltimore, MD, March 16, 2012
88. Schlumberger Doll Research Center, Cambridge, MA, May 16, 2012
89. Polytechnic Institute of New York University, June 20, 2012
90. Imperial College London, August 20, 2012
91. École Polytechnique Fédérale de Lausanne, August 23, 2012

92. Workshop on Next Generation Medical Imaging, Carnegie Mellon University, September 5, 2012
93. Carnegie Mellon University, December 5, 2012
94. Washington University, March 20, 2013
95. Microsoft Research, Redmond, WA, May 16, 2013
96. Google Research, Mountain View, CA, May 30, 2013
97. Boston University Electrical and Computer Engineering Colloquium, June 5, 2013
98. February Fourier Talks, University of Maryland, February 21, 2014
99. SIAM Conference on Imaging Science, Hong Kong, May 12, 2014
100. École Polytechnique Fédérale de Lausanne, Computer and Communication Sciences Summer Research Institute, June 16, 2014
101. Boston University Electrical and Computer Engineering Colloquium, October September 22, 2014
102. Stanford Compression Forum, Palo Alto, CA, January 22, 2015
103. Information Theory and Applications Workshop, San Diego, CA, February 2, 2015.
104. Stanford Information Theory Forum, Palo Alto, CA, May 1, 2015
105. OSA Computational Optical Sensing and Imaging, Arlington, VA, June 9, 2015.
106. IEEE Santa Clara Valley Signal Processing Society Chapter, Sunnyvale, CA, March 3, 2016.
107. University of California, Berkeley, joint seminar of Photobears (joint student chapter of the SPIE and OSA) and the Berkeley Laboratory of Information and Systems Sciences, May 18, 2016.
108. Technicolor Los Altos Research Center, Los Altos, CA, June 22, 2016.

TUTORIALS

1. “Wavelets and Applications: State of the Art,” 45th SPIE Annual Meeting, San Diego, CA, Aug. 3, 2000 (with J. Kovačević).
2. “WWW: World Wide Wavelets,” IEEE Int. Conf. on Image Processing, Vancouver, BC, Canada, Sep. 10, 2000 (with M. Vetterli and J. Kovačević).
3. “Teaching Signal Processing with Geometry,” IEEE Int. Conf. on Acoustics, Speech, and Signal Process., Kyoto, Japan, March 26, 2012 (with M. Vetterli).
4. “Teaching Signal Processing with Geometry,” European Signal Process. Conf., Bucharest, Romania, Aug. 27, 2012 (with M. Vetterli).
5. “Teaching Image Processing with Geometry,” IEEE Int. Conf. on Image Process., Orlando, FL, Sep. 30, 2012 (with J. Kovačević).

TEACHING AND EDUCATIONAL CONTRIBUTIONS

Probability Theory in Electrical and Computer Engineering (BU ENG EC 381)

Role: Lecturer Fall 2016.

Topics: Modeling uncertainty in electrical and computer systems; experiments, models, and probabilities; discrete and continuous random variables; reliability models for circuits; probability distributions; moments and expectations; random vectors; functions of random variables; sums of random variables and limit theorems; signal detection and estimation; basic stochastic processes; discrete-time Markov chains; applications to statistical modeling and interpretation of experimental data in computer, communication, and optical systems.

Digital Signal Processing (BU ENG EC 516)

Role: Lecturer Spring 2014.

Topics: Hilbert space formulation of continuous-time and discrete-time signals; projection theorem and its applications; orthogonal and biorthogonal signal expansions; Fourier transforms for periodic and aperiodic sequences and functions; sampling; uncertainty principles and the time-frequency plane; basics of quantization and source coding.

Comments: Adjusted this graduate-level course to provide more sophisticated and generalizable tools by following *Foundations of Signal Processing*.

Wavelets, Approximation, and Compression (MIT 6.342)

Role: Lecturer Fall 2005, Spring 2007, Spring 2009, and Spring 2011.

Topics: Hilbert space formulation of continuous-time and discrete-time signals; sampling; orthogonal and biorthogonal signal expansions; uncertainty principles and the time-frequency plane; two-channel filter banks, iterated filter banks, discrete wavelet transforms, multiresolution analysis, wavelet bases, regularity, approximation properties, and nonlinear approximation; basics of quantization and source coding; compression, denoising, and other image processing using wavelets; and advanced topics from the current research literature.

Comments: Developed this new graduate-level course and co-authored textbooks *Foundations of Signal Processing* and *Fourier and Wavelet Signal Processing*.

Discrete-Time Signal Processing (MIT 6.341)

Role: Lecturer Spring 2005, Fall 2006, and Fall 2009.

Topics: Representation, analysis, and design of discrete time signals and systems; discrete-time processing of continuous-time signals; decimation, interpolation, and sampling rate conversion; flowgraph structures for DT systems; time- and frequency-domain design techniques for recursive (IIR) and non-recursive (FIR) filters; parametric signal modeling and linear prediction; discrete Fourier transform, FFT algorithm; short-time Fourier analysis and filter banks; and multirate techniques.

Comments: Jointly responsible for this course with Alan Oppenheim, and made contributions acknowledged in the Third Edition of Oppenheim and Schaffer's *Discrete-Time Signal Processing*.

Probabilistic Systems Analysis (MIT 6.041) and **Applied Probability** (MIT 6.431)

Roles: Lecturer Spring 2010 and Recitation Instructor Spring 2004, Fall 2004, Spring 2006, Spring 2008, Fall 2008, Fall 2010.

Topics: An introduction to probability theory, and the modeling and analysis of probabilistic systems; sample space, probabilistic models, conditional probability; discrete and continuous random variables; transform techniques; Bernoulli and Poisson processes; Markov processes; limit theorems and elements of statistical inference.

Comments: Made contributions acknowledged in the Second Edition of Bertsekas and Tsitsiklis's *Introduction to Probability*.

STUDENTS SUPERVISED

1. Jonathan A. Kelner – Bell Labs intern, 1999. Now an Associate Professor, Massachusetts Institute of Technology.
2. Pier Luigi Dragotti – Bell Labs intern, 2000. Now a Professor, Imperial College, London.
3. Wei Wang – Bell Labs intern, 2000.
4. Raman Venkataramani – Bell Labs intern, 2000. Now a Senior Research Engineer, Seagate Technology.
5. Francois Masson – Bell Labs intern, 2000.
 - MS 2000: “Multiple Description Robust Low-Delay Speech Coding”
 - Best Thesis Award
6. Simon Skaria – Digital Fountain intern, 2001. Now a Senior Program Manager, Microsoft.
7. Demba Ba – student at MIT, 2004–2006. Now an Assistant Professor, Harvard University.
 - SM May 2006: “Nonlinear Transform Coding using Lossless Polar Coordinates”
8. Ruby Pai – student at MIT, 2005–2006. Now Member of Technical Staff, Sandia National Laboratory.
 - MEng August 2006: “Nonadaptive Lossy Encoding of Sparse Signals”
9. Julius Kusuma – student at MIT, 2004–2006. Now a Principal Scientist with Schlumberger–Doll Research Center.
 - PhD August 2006: “Economical Sampling of Parametric Signals”
10. Ricky D. Nguyen – student at MIT, 2006–2007.
 - MEng June 2007: “Rate Control and Bit Allocation for JPEG Transcoding”
11. Behnam Jafarpour – student at MIT, 2007–2008. Now an Associate Professor at the University of Southern California.
 - SM February 2008: “Reconstruction of Channelized Features in Geological Media Using Sparsity Constraints”
12. Vinith Misra – student at MIT, 2007–2008. Now a Research Staff Member at IBM Watson Laboratory.
 - MEng May 2008: “Functional Quantization”
 - 2008 David Adler Memorial Prize, Winner (best MIT MEng thesis in electrical engineering)
13. Adam C. Zelinski – student at MIT, 2004–2008. Now Managing Director of TrexQuant Management, LLC.
 - PhD September 2008: “Improvements in Magnetic Resonance Imaging Excitation Pulse Design”
14. Ha Quy Nguyen – student at MIT, 2007–2009. Now a postdoctoral researcher, École Polytechnique Fédérale de Lausanne.
 - SM September 2009: “Generalizations of Permutation Source Codes”
15. Lav R. Varshney – student at MIT, 2004–2010. Now an Assistant Professor at the University of Illinois at Urbana-Champaign.
 - SM May 2006: “Optimal Information Storage: Nonsequential Sources and Neural Channels”
 - 2006 Ernst A. Guillemin Thesis Prize, Winner (best MIT SM thesis in electrical engineering)
 - PhD March 2010: “Unreliable and Resource-Constrained Decoding”
 - 2011 Jin-Au Kong Award, Honorable Mention (best MIT PhD thesis in electrical engineering)
16. Michael T. Snella – student at MIT, 2009–2010. Now with Sandia National Laboratory.
 - MEng September 2010: “Drift Correction for Scanning-Electron Microscopy”
17. Ulugbek Kamilov – visiting student at MIT, 2010–2011. Now a Research Scientist, Mitsubishi Electric Research Laboratories.
 - MS March 2011: “Optimal Quantization for Sparse Reconstruction with Relaxed Belief Propagation”
18. Daniel S. Weller – student at MIT, 2006–2012. Now an Assistant Professor at the University of Virginia.
 - SM May 2008: “Mitigating Timing Noise in ADCs through Digital Post-Processing”
 - PhD March 2012: “Accelerating Magnetic Resonance Imaging by Unifying Sparse Models and Multiple Receivers”

19. Vahid Montazerhodjat – student at MIT, 2010–2013.
SM February 2013: “Photon-Limited Time of Flight Depth Acquisition: New Parametric Model and Its Analysis”
20. John Z. Sun – student at MIT, 2007–2013. Now a Quantitative Researcher with PDT Partners, LLC.
SM September 2009: “Compressive Sensor Networks: Fundamental Limits and Algorithms”
PhD May 2013: “Quantization in Acquisition and Computation Networks”
21. Jonathan B. Mei – student at MIT, 2012–2013. A PhD student at Carnegie Mellon University since Fall 2013.
MEng May 2013: “Algorithms for 3D Time-of-Flight Imaging”
 - 2013 David Adler Memorial Prize, 2nd Place (best MIT MEng thesis in electrical engineering)
22. Andrea B. Colaço – student at MIT, co-advised with Christopher M. Schmandt (Media Laboratory). Now with Nest (Google/Alphabet).
PhD June 2014: “Compact and Low-Power Computational 3D Sensors for Gestural Input”
23. Joong B. Rhim – student at MIT, 2008–2014. Now with GroupM Data and Analytics R&D Group.
SM September 2010: “Quantization of Prior Probabilities in Bayesian Group Decision-Making”
PhD June 2014: “Aggregation and Influence in Teams of Imperfect Decision Makers”
24. G. Ahmed Kirmani – student at MIT, 2010–2014. Now with Nest (Google/Alphabet).
PhD December 2014: “Computational Time-Resolved Imaging”
 - 2015 Jin-Au Kong Award, Honorable Mention (best MIT PhD thesis in electrical engineering)
25. Jeff Craley – student at BU, 2014–2015. Now a PhD student at Johns Hopkins University.
MS August 2015: “Low Ion Dose Imaging in the Helium Ion Microscope Under Neyman Type A Statistics”
26. Dongeek Shin – student at MIT, 2012–2016. Now with Nest (Google/Alphabet).
SM June 2014: “Computational 3D and Reflectivity Imaging with High Photon Efficiency”
PhD February 2016: “Computational Imaging with Small Numbers of Photons,”
27. Joshua Rapp – student at BU, 2014–present.

THESIS COMMITTEES (in addition to students supervised; at MIT except as noted)

1. Brian A. Heng – “Adaptive Multiple Description Mode Selection for Error Resilient Video Communications,” PhD, Electrical Engineering and Computer Science, June 2005.
2. Petros T. Boufounos – “Quantization and Erasures in Frame Representations,” PhD, Electrical Engineering and Computer Science, January 2006.
3. Jan Østergaard – “Multiple-Description Lattice Vector Quantization,” PhD, Technische Universiteit Delft, Netherlands, June 2007.
4. Julie S. Chalfant – “Three-Dimensional Object Registration Using Wavelet Features,” PhD, Mechanical Engineering (Ocean Engineering program), February 2008.
5. Sourav R. Dey – “Randomized Sampling and Multiplier-Less Filtering,” PhD, Electrical Engineering and Computer Science, February 2008.
6. Tony Q. S. Quek – “Efficient Approaches to Robust and Cooperative Wireless Network Design,” PhD, Electrical Engineering and Computer Science, February 2008.
7. Vijay Divi – “Estimation and Calibration Algorithms for Distributed Sampling Systems,” PhD, Electrical Engineering and Computer Science, September 2008.
8. Milan Derpich – “Optimal Source Coding with Signal Transfer Function Constraints,” PhD, University of Newcastle, Callaghan, New South Wales, Australia, December 2008.
9. Mehmet Akçakaya – “An Information Theoretic Approach to Compressed Sensing and Its Utility in Magnetic Resonance Imaging,” PhD, Harvard University, May 2010.
10. Rayan Saab – “Compressed Sensing: Decoding and Quantization,” PhD, University of British Columbia, Vancouver, BC, Canada, May 2010.

11. Pedro C. Pinto – “Stochastic Wireless Communication Networks in Fading Dispersive Channels,” PhD, Electrical Engineering and Computer Science, June 2010.
12. Charles Swannack – “Channel State Quantization in MIMO Broadcast Systems: Architectures and Codes,” PhD, Electrical Engineering and Computer Science, June 2010.
13. Vivienne Sze – “Parallel Algorithms and Architectures for Low Power Video Decoding,” PhD, Electrical Engineering and Computer Science, June 2010.
14. Chung Chan – “Generating Secret in a Network,” PhD, Electrical Engineering and Computer Science, September 2010.
15. Wesley M. Gifford – “Bandwidth Scaling Behavior in Wireless Systems: Theory, Experimentation, and Performance Analysis,” PhD, Electrical Engineering and Computer Science, September 2010.
16. Fatih Kamaşlı – “Transforms for Prediction Residuals in Video Coding,” PhD, Electrical Engineering and Computer Science, September 2010.
17. Behtash Babadi – “Fundamental Limits and Constructive Methods for Estimation and Sensing of Sparse Signals,” PhD, Harvard University, May 2011.
18. Szymon Kazimierz Jakubczak – “SoftCast: Exposing a Waveform Interface to the Wireless Channel for Scalable Video Broadcast,” PhD, Electrical Engineering and Computer Science, June 2011.
19. Shay Maymon – “Sampling and Quantization for Optimal Reconstruction,” PhD, Electrical Engineering and Computer Science, June 2011.
20. Dennis Wei – “Design of Discrete-Time Filters for Computational Efficiency,” PhD, Electrical Engineering and Computer Science, June 2011.
21. Fred Chen – “Energy-Efficient Algorithms, Circuits and Devices for Power Constrained Systems,” PhD, Electrical Engineering and Computer Science, September 2011.
22. Hyun Sung Chang – “Informative Sensing: Theory and Applications,” PhD, Electrical Engineering and Computer Science, June 2012.
23. Trina Kok – “Magnetic Resonance Spectroscopic Imaging with 2D Spectroscopy for the Detection of Brain Metabolites,” PhD, Electrical Engineering and Computer Science, September 2012.
24. Sumeet Kumar – “Mobile Sensor Systems for Field Estimation and ‘Hot Spot’ Identification,” PhD, Mechanical Engineering, February 2014.
25. Ahmet Tuysuzoglu – “Robust Inversion and Detection Techniques for Improved Imaging Performance,” PhD, Electrical and Computer Engineering, Boston University, May 2014.
26. Nicholas D. Hardy – “Optimal Standoff Imaging using Structured Laser Illumination and Graphical Models,” PhD, Electrical Engineering and Computer Science, September 2014.
27. Joseph Wang – “Local Learning by Partitioning,” PhD, Electrical and Computer Engineering, Boston University, January 2015.
28. Dheera Venkatraman – “Quantum-mimetic imaging,” PhD, Electrical Engineering and Computer Science, February 2015.
29. Weicong Ding – “Learning Mixed Membership Models with a Separable Latent Structure: Theory, Provably Efficient Algorithms, and Applications,” PhD, Electrical and Computer Engineering, Boston University, June 2015.
30. Jonathan Wu – “Gesture Passwords: Concepts, Methods and Challenges,” PhD, Electrical and Computer Engineering, Boston University, May 2016.
31. Zachary Sun – “Reduced and Coded Sensing Methods for X-Ray Based Security,” PhD, Electrical and Computer Engineering, Boston University, August 2016.
32. Michael George Sidhom Farag – “Interference Channels: Theoretical and Empirical Potentials,” PhD, Electrical and Computer Engineering, Boston University, December 2016 (anticipated).

THESIS DEFENSES CHAIRED (at BU)

1. Ke Chen – “Reconstruction Algorithms for Multi-spectral Diffraction Imaging,” March 2014.
2. Jing Conan Wang – “Anomaly Detection and Dynamic Decision Making for Stochastic Systems,” July 2014.

SERVICE

Co-organized (with Jelena Kovačević) the DIMACS Workshop on Source Coding and Harmonic Analysis, New Brunswick, NJ, May 8–10, 2002.

Lead organizer of Challenges in Theoretical and Applied Signal Processing—Sputnik50@EPFL, 2007.

Program committee for IEEE Data Compression Conf. 2002, 2006–2015.

Program committee for IEEE Int. Conf. Image Processing 2003–present.

Program committee for IEEE Int. Conf. Acoustics, Speech, & Signal Processing 2004–present.

Program committee for IEEE Int. Symp. on Multimedia over Wireless, 2005.

Program committee for IEEE Int. Symp. Information Theory, 2008, 2012.

Program committee for IEEE Information Theory Workshop, 2011, 2013.

Program committee for SPIE Wavelet Applications in Signal & Image Processing VIII, 2000.

Program committee for SPIE Wavelet Applications in Signal & Image Processing IX, 2001.

Program committee for 20th European Signal Processing Conf. (EUSIPCO 2012), 21st European Signal Processing Conf. (EUSIPCO 2013).

Technical committee member for 6th Int. Conf. on Computing Communications and Networking Technologies (ICCCNT 2015).

Program committee for Int. Conf. Computational Imaging, 2017.

Awards Subcommittee Chair of the Image and Multiple Dimensional Signal Processing (IMDSP) Technical Committee, IEEE Signal Processing Society, 2006–2009.

Student Award Committee for IEEE Int. Conf. Image Processing 2012.

Panelist for National Defense Science & Engineering Graduate Fellowship 2000.

Reviewer for the Israel Science Foundation 2004.

Review panelist for the Austrian Science Fund (FWF) National Research Network (NFN) program 2007, 2014.

Expert Referee for the Research Council of Norway 2007.

Judge for Siemens Competition in Math, Science and Technology (formerly the Siemens Westinghouse Competition), 2008.

Panelist for National Science Foundation 2008, 2009, 2012, 2013.

External Reviewer for Research Grants Council of Hong Kong, 2010.

Reviewer for the following journals: Advances in Computational Mathematics, Applied & Computational Harmonic Analysis, Automatica, Biometrika, EURASIP J. Applied Signal Processing, Foundations & Trends in Signal Processing, Foundations of Computational Mathematics, IEEE Communications Magazine, IEEE J. Selected Topics in Signal Processing, IEEE Signal Processing Letters, IEEE Signal Processing Magazine, IEEE Trans. Audio, Speech, and Language Processing, IEEE Trans. Circuits & Systems for Video Technology, IEEE Trans. Communications, IEEE Trans. Image Processing, IEEE Trans. Information Theory, IEEE Trans. Signal Processing, J. American Statistical Association, J. Fourier Analysis & Applications, J. VLSI Signal Processing, Optical Engineering, Proc. National Academy of Sciences, Sampling Theory in Signal & Image Processing, SIAM J. Matrix Analysis & Applications, Transportation Research Part C: Emerging Technologies