

BHASKAR D. RAO

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Education

- Ph.D** Electrical Engineering, University of Southern California, Los Angeles (August 1983)
- M.S** Computer Engineering, University of Southern California, Los Angeles, (1981)
- B.Tech** Electronics and Electrical Communication Engineering, I.I.T. Kharagpur, India (1979)

Professional Experience

- Professor, Department of Electrical and Computer Engineering, University of California, San Diego. (1995-present)
- Consultant, Qualcomm Inc., Fall 2011
- Visiting Researcher, Speech technology department, Microsoft Research, (Winter 2012)
- Consultant, Speech Research Department, AT&T Bell Laboratories, Murray Hill, New Jersey, (Jan.-June, 1995).
- Associate Professor, Department of Electrical and Computer Engineering, University of California, San Diego. (1989-1995)
- Visiting Associate Professor, Department of Electrical Engineering, Stanford University. (1989-1990)
- Assistant Professor, Department of Electrical and Computer Engineering, University of California, San Diego. (1989-1995)

Awards and Honors

1. Director, Center for Wireless Communications, 2008-2011
2. Ericsson endowed chair in wireless access networks since May 2008.
3. IEEE Signal Processing Society Distinguished Lecturer for the term 1 January 2014 through 31 December 2015.
4. IEEE Fellow, 2000, for the statistical analysis of subspace algorithms for harmonic retrieval.
5. 2012 Signal Processing Society (SPS) Best Paper Award for the paper An Empirical Bayesian Strategy for Solving the Simultaneous Sparse Approximation Problem, by David P. Wipf and Bhaskar D. Rao published in IEEE Transaction on Signal Processing, Volume: 55, No. 7, July 2007
6. 2008 Stephen O. Rice Prize Paper Award in the Field of Communication Systems for the paper Network Duality for Multiuser MIMO Beamforming Networks and Applications, by B. Song, R. L. Cruz and B. D. Rao that appeared in the IEEE Transactions on Communications, Vol. 55, No. 3, March 2007, pp. 618-630.
(<http://www.comsoc.org/awards/rice.html>)
7. Best paper award at the Fall 2013, IEEE Vehicular Technology Conference for the paper Multicell Random Beamforming with CDF-based Scheduling: Exact Rate and Scaling Laws, by Yichao Huang and Bhaskar D Rao.
8. Best paper Award (one of two papers chosen) at the Speech Coding Workshop, 2000, for the paper A. D. Subramaniam and B. D. Rao, "PDF Optimized Parametric Vector Quantization of Speech Line Spectral Frequencies."
9. Best student paper award at NIPS 2006 for D. Wipf for the paper "Analysis of Empirical Bayesian Methods for Neuroelectromagnetic Source Localization," by D.P.Wipf, R.R. Ramirez, J.A. Palmer, S. Makeig, and B.D. Rao in Advances in Neural Information Processing Systems, Dec. 2006 (<http://nips.cc/ConferenceInformation/PaperAwards>)
10. Student paper award for Jun Zheng at ICASSP 2006 for the paper "Capacity analysis of multiple antenna systems with mismatched channel quantization schemes," by J. Zheng and B. D. Rao, ICASSP, Toulouse, France, May 2006.
11. Best Student Paper Award for J. McCall and D. Wipf at the IEEE International Workshop on Machine Vision for Intelligent Vehicles (MVIV'05) held in conjunction with IEEE International Conference on Computer Vision and Pattern Recognition (CVPR'05) at San Diego, CA, June 21, 2005 for the paper "Lane change intent analysis using robust operators and sparse Bayesian learning" by J. McCall, D. Wipf, M. Trivedi and B. D. Rao
12. Student paper award for Haichang Sui for the paper "RAKE Finger Placement for CDMA Downlink Equalization," by H. Sui, E. Masry and B. D. Rao at the 2005 IEEE International Conference on Acoustics, Speech, and Signal Processing, Philadelphia, PA, Mar. 19-23, 2005.

13. IBM Faculty Award, 2002
14. Member of the EURASIP Signal Processing editorial board
15. Member of the Signal Processing for Communications Technical committee of the IEEE Signal Processing Society (2005-2008).

Selected Publications

Compressed Sensing/Sparse Signal Recovery

1. Y. Jin and B. D. Rao, "Support Recovery of Sparse Signals in the Presence of Multiple Measurement Vectors" IEEE Transactions on Information Theory, Volume: 59 , Issue: 5, Page(s): 3139 - 3157, May 2013
2. Z. Zhang and B. D. Rao, "Sparse Signal Recovery with Temporally Correlated Source Vectors Using Sparse Bayesian Learning," IEEE Journal of Selected Topics in Signal Processing, Special Issue on Adaptive Sparse Representation of Data and Applications in Signal and Image Processing, vol.5, no. 5, pp. 912-926, Sept. 2011
3. D. P. Wipf, B. D. Rao and S. Nagarajan, "Latent Variable Bayesian Models for Promoting Sparsity," IEEE Transactions on Information Theory, pages, 6236-6255, Sept. 2011
4. S. F. Cotter, B. D. Rao, K. Engan, and K. Kreutz-Delgado, "Sparse Solutions to Linear Inverse Problems with Multiple Measurement Vectors," IEEE Trans. on Signal Processing, 2005.
5. S. F. Cotter and B. D. Rao, "Sparse Channel Estimation Via Matching Pursuit with Application to Equalization" IEEE Trans. on Communications, Vol. 50, Issue 3, March 2002
6. I. F. Gorodnitsky and B. D. Rao, "Sparse Signal Reconstruction from Limited Data Using FOCUSS: A Re-Weighted Norm Minimization Algorithm," IEEE Trans. On Signal Processing, Mar-1997,

Wireless Communications

1. Y. Huang and Bhaskar D. Rao, "An Analytical Framework for Heterogeneous Partial Feedback Design in Heterogeneous Multicell OFDMA Networks," IEEE Transactions on Signal Processing, vol. 61, no. 3, pp. 753 - 769, February 1, 2013
2. Y. Huang and B. D. Rao, "Random Beamforming with Heterogeneous Users and Selective Feedback: Individual Sum Rate and Individual Scaling Laws ", IEEE Transactions on Wireless Communications, Volume 12, Issue 5, Pages 2080-2090, May 2013.
3. Y. Isukapalli and B. D. Rao, "Packet Error Probability of a Transmit Beamforming System with Imperfect Feedback," IEEE Transactions on Signal Processing, April 2010.
4. M. Pugh and B. D. Rao, "Reduced Feedback Schemes using Random Beamforming in MIMO Broadcast Channels," IEEE Transactions on Signal Processing, March 2010
5. J. C. Roh and B. D. Rao, "Transmit Beamforming in Multiple-Antenna Systems with Finite Rate Feedback: A VQ-Based Approach," IEEE Trans. Information Theory. vol. 52, no. 3, pp. 1101-1112, Mar. 2006.
6. J. Zheng, E. Duni, and B. D. Rao, "Analysis of multiple antenna systems with low-rate feedback using high resolution quantization theory", IEEE Trans. on Signal Processing, April 2007.

Speech and Audio-Visual Processing

1. A. Masnadi-Shirazi and Bhaskar D. Rao, "An ICA-SCT-PHD Filter Approach for Tracking and Separation of Unknown Time-Varying Number of Sources," *IEEE Transactions on Audio, Speech and Language Processing*, Volume: 21, Issue: 4, Page(s): 828 - 841, April 2013
2. W. Zhang and B.D. Rao, "A Two Microphone-Based Approach for Source Localization of Multiple Speech Sources," *IEEE Transactions on Audio, Speech and Language Processing*, Vol. 18, No. 8 (November 2010), pp. 1913-1928.
3. S. Shivappa, M. M. Trivedi, and B. D. Rao, "Audio-visual Information Fusion In Human Computer Interfaces and Intelligent Environments: A Survey," *Proceedings of the IEEE*, October 2010.
4. E. R. Duni and B. D. Rao, "High-Rate Optimized Recursive Vector Quantization Structures Using Hidden Markov Models", *IEEE Transactions on Audio, Speech and Language Processing*, Volume 15, Issue 3, pages 756-769, March 2007.
5. S. Dharanipragada, U. H. Yapanel, and B. D. Rao, "Robust Feature Extraction for Continuous Speech Recognition using the MVDR Spectrum Estimation Method", *IEEE Trans. on Speech, Audio and Language Processing*, pages 224-234, Jan. 2007.
6. A. D. Subramaniam, B. D. Rao, and W. R. Gardner, "Low-Complexity Source Coding using Gaussian Mixture Models, Lattice Vector Quantization and Recursive Coding with Application to Speech Spectrum Quantization," *IEEE Trans. on Speech and Audio Proc*, 2006.

Statistical Signal Processing

1. S.Y. Kung, K.S. Arun, R.J. Gal-Ezer, and B.D. Rao, "Wavefront array processor: language, architecture and applications," *IEEE Transactions on Computers*, Vol. 31, No. 11 (November 1982), pp. 1054-1066.
2. B.D. Rao and R. Peng, "Tracking characteristics of the constrained IIR adaptive notch filter," *IEEE Transactions on Acoustics, Speech, and Signal Processing (ASSP)*, Vol. 36, No. 9 (September 1988), pp. 1466-1479.
3. B.D. Rao and K.V.S. Hari, "Performance analysis of root-music," *IEEE Transactions on Acoustics, Speech, and Signal Processing (ASSP)*, Vol. 37, No. 12 (December 1989), pp. 1939-1949.
4. B.D. Rao and K.S. Arun, "Model based processing of signals: a state space approach," *Proceedings of the IEEE*, Vol. 80, No. 2 (February 1992), pp. 283-309.
5. B.D. Rao and K.V.S. Hari, "Weighted subspace methods and spatial smoothing: analysis and comparison," *IEEE Transactions on Signal Processing*, Vol. 41, No. 2 (February 1993), pp. 788-803.

For a complete list of publications (> 120 journal and 260 conference papers), please visit the lab website dsp.ucsd.edu