David Paul Wipf

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Education

Ph.D. Electrical and Computer Engineering, 2007
University of California, San Diego
Thesis Title: Bayesian Methods for Finding Sparse Representations
Advisor: Professor Bhaskar Rao

M.S. Electrical and Computer Engineering, 2003
University of California, San Diego
Concentration Area: Intelligent Systems, GPA: 3.97/4.00

B.S. Electrical Engineering, Highest Honors
University of Virginia
Concentration Area: Electrophysics

Awards

Reviewer Award, NIPS 2013; ICCV 2013, 2015; CVPR, 2013, 2015-17
The IEEE Signal Processing Society Best Paper Award, 2012
NIH Postdoctoral Fellowship, 2009-2011
Abstract Award, Human Brain Mapping, 2009
Young Investigator Award, International Conference on Biomagnetism, 2008
Okinawa Computational Neuroscience Course (17% acceptance rate), 2007
Outstanding Student Paper Award, Neural Information Processing Systems (NIPS), 2006
NSF Fellow in Vision and Learning in Humans and Machines, 2005-2006
ARCS Foundation Scholar (one of three awarded in ECE Department), 2003-2006
Best Paper Award, IEEE Int. Work. Machine Vision for Intelligent Vehicles, 2005
ECE Department Graduate Student Research Assistantship, 2001-2005
NSF EAPSI Fellowship, Peking University, 2004
Powell Foundation Fellowship, 2000-2001

Research Experience

Lead Researcher
Microsoft Research, Beijing, China 2011 - present
Derive non-convex, Bayesian-inspired algorithms for finding low-dimensional structure in high-dimensional data, with application to computer vision and statistical signal processing problems. Additionally, analyze intimate connections between deep generative models, recurrent neural networks, and more traditional dimensionality reduction techniques such as sparse estimation or rank minimization.

Postdoctoral Fellow
University of California, San Francisco 2007 - 2011
Developed robust Bayesian statistical models for imaging functional brain activity and for finding sparse signal representations. These techniques are quite general and naturally serve any number of data mining, pattern recognition, and search applications requiring robust feature selection and evaluations of uncertainty.

Graduate Student Research Assistant
University of California, San Diego 2001 - 2006
Analyzed latent variable Bayesian methods for extracting sparse subsets of predictive features from large redundant dictionaries of candidate attributes. Also, applied these results to neuroimaging, independent component analysis, sparse coding, and the classification of human intentions.

Journal Publications

B. Xin, Y. Wang, W. Gao, and D. Wipf, "Building Invariances into Sparse Subspace Clustering," *IEEE Transactions on Signal Processing*, 2017 (to appear).

D. Chen, X. Cao, D. Wipf, and J. Sun, "An Efficient Joint Formulation for Bayesian Face Verification," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 39, no. 1, January 2017.

B. Xin, Y. Wang, W. Gao, and D. Wipf, "Exploring Algorithmic Limits of Matrix Rank Minimization under Affine Constraints," *IEEE Transactions on Signal Processing*, vol. 64, no. 19, April 2016.

Z. Zhou, G. Chen, Y. Dong, D. Wipf, J. Snyder, and X. Tong, "Sparse-as-Possible SVBRDF Acquisition," *ACM Transactions on Graphics*, vol. 35, no. 6, November 2016.

D. Wipf and H. Zhang, "Revisiting Bayesian Blind Deconvolution," *Journal of Machine Learning Research*, vol. 15, November 2014.

S. Ikehata, D. Wipf, Y. Matsushita, and K. Aizawa, "Photometric Stereo Using Sparse Bayesian Regression for General Diffuse Surfaces," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 36, no. 9, September 2014.

H. Zhang and D. Wipf, "Multi-Observation Blind Deconvolution with an Adaptive Sparse Prior," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 36, no. 8, August 2014.

J. Owen, D. Wipf, H. Attias, K. Sekihara, and S. Nagarajan, "Performance evaluation of the Champagne source reconstruction algorithm on simulated and real M/EEG data," *NeuroImage*, vol. 60, no. 1, March 2012.

D. Wipf, B. Rao, and S. Nagarajan, "Latent Variable Bayesian Models for Promoting Sparsity," *IEEE Transactions on Infomation Theory*, vol. 57, no. 9, September 2011.

M. Seeger and D. Wipf, "Variational Bayesian Techniques for Sparse Inference and Estimation," *IEEE Signal Processing Magazine*, vol. 27, no. 6, November 2010.

D. Wipf and S. Nagarajan, "Iterative Reweighted ℓ_1 and ℓ_2 Methods for Finding Sparse Solutions," *Journal of Selected Topics in Signal Processing (Special Issue on Compressive Sensing)*, vol. 4, no. 2, April 2010.

D. Wipf, J. Owen, H. Attias, K. Sekihara, and S. Nagarajan, "Robust Bayesian Estimation of the Location, Orientation, and Timecourse of Multiple Correlated Neural Sources using MEG," *NeuroImage*, vol. 49, no. 1, January 2010. (**Abstract Award, Human Brain Mapping, 2009**)

R. Ramirez, D. Wipf, and S. Baillet, "Neuroelectromagnetic Source Imaging of Brain Dynamics," W. Chaovalitwongse, P. Pardalos, and P. Xanthopoulos, editors, *Computational Neuroscience*, Springer, 2010.

D. Wipf and S. Nagarajan, "A Unified Bayesian Framework for MEG/EEG Source Imaging," *NeuroImage*, vol. 44, no. 3, February 2009. (**Young Investigator Award, International Conference on Biomagmagnetism, 2008**)

D. Wipf and B. Rao, "An Empirical Bayesian Strategy for Solving theSimultaneous Sparse Approximation Problem," *IEEE Transactions on Signal Processing*, vol. 55, no. 7, July 2007. (**The 2012 Signal Processing Society Best Paper Award**)

J. McCall, D. Wipf, M. Trivedi, and B. Rao, "Lane Change Intent Analysis Using Robust Operators and Sparse Bayesian Learning," *IEEE Transactions on Intelligent Transportation Systems*, vol. 8, no. 3, 2007. (**Best Paper Award, IEEE International Workshop on Machine Vision for Intelligent Vehicles, 2005**)

D. Wipf and B. Rao, "Sparse Bayesian Learning for Basis Selection," *IEEE Transactions on Signal Processing*, vol. 52, no. 8, August 2004.

Select Refereed Conference Publications*

H. He, B. Xin, and D. Wipf, "From Bayesian Sparsity to Gated Recurrent Nets," *Advances in Neural Information Processing Systems (NIPS)*, 2017 (to appear, **Oral**)

Q. Fan, J. Yang, G. Hua, B. Chen, and D. Wipf, "A Generic Deep Architecture for Single Image Reflection Removal and Image Smoothing," *International Conference on Computer Vision (ICCV)*, 2017.

Y. Wang, B. Dai, G. Hua, J. Aston, and D. Wipf, "Green Generative Modeling: Recycling Dirty Data using Recurrent Variational Autoencoders," *Uncertainty in Artificial Intelligence (UAI)*, 2017.

B. Xin and D. Wipf, "Data-Dependent Sparse Subspace Clustering," *Uncertainty in Artificial Intelligence (UAI)*, 2017.

B. Xin, Y. Wang, W. Gao, and D. Wipf, "Maximal Sparsity with Deep Networks?," D. Lee, M. Sugiyama, and U. Luxburg, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2016.

T. Oh, Y. Matsushita, I. Kweon, and D. Wipf, "A Pseudo-Bayesian Algorithm for Robust PCA," D. Lee, M. Sugiyama, and U. Luxburg, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2016.

D. Wipf, "Analysis of VB Factorizations for Sparse and Low-Rank Estimation," *International Conference on Machine Learning (ICML)*, 2016. (**Oral**)

***** These are the highly selective computer science conference publications for which I was a major technical contributor.

D. Wipf, Y. Dong, and B. Xin, "Subspace Clustering with a Twist," *Uncertainty in Artificial Intelligence (UAI)*, 2016.

T. Shi, F. Agostinelli, M. Staib, D. Wipf, and T. Moscibroda, "Improving Survey Aggregation with Sparsely Represented Signals," *Knowledge Discovery and Data Mining (KDD)*, 2016.

Y. Wang, D. Wipf, J. Yun, W. Chen, and I. Wassell, "Clustered Sparse Bayesian Learning," *Uncertainty in Artificial Intelligence (UAI)*, 2015. (**Oral**)

Y. Wang, D. Wipf, W. Chen, Q. Ling, and I. Wassell, "Multi-Task Learning for Subspace Segmentation," *International Conference on Machine Learning (ICML)*, 2015. (**Oral**)

B. Xin and D. Wipf, "Pushing the Limits of Affine Rank Minimization by Adapting Probabilistic PCA," *International Conference on Machine Learning (ICML)*, 2015. (**Oral**)

Y. Wu, J. Yun, and D. Wipf "Understanding and Evaluating Sparse Linear Discriminant Analysis," *Artificial Intelligence and Statistics (AISTATS)*, 2015. (**Oral**)

D. Wipf, J. Yun, and Q. Ling, "Augmented Bayesian Compressive Sensing," *Data Compression Conference (DCC)*, 2015. (**Oral**)

Q. Li, J. Wang, D. Wipf, and Z. Tu, "Fixed-Point Model for Structured Labeling," *International Conference on Machine Learning (ICML)*, 2013.

X. Cao and D. Wipf, "A Practical Transfer Learning Algorithm for Face Verification," *International Conference on Computer Vision (ICCV)*, 2013. (**Oral**)

H. Zhang and D. Wipf, "Non-uniform camera shake removal using a spatially-adaptive sparse Penalty," C. Burges, L. Bottou, M. Welling, Z. Ghahramani, and K. Weinberger, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2013. (**Oral**)

H. Zhang and D. Wipf, "Multi-Image Blind Deblurring Using a Coupled Adaptive Sparse Prior," *IEEE International Conference on Computer Vision and Pattern Recognition (CVPR)*, 2013.

D. Wipf and Y. Wu, "Dual-Space Observations from the Sparse Linear Model," P. Bartlett, F. Pereira, C. Burges, L. Bottou, and K. Weinberger, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2012.

D. Wipf, "Non-Convex Rank Minimization via an Empirical Bayesian Approach," *Uncertainty in Artificial Intelligence (UAI)*, 2012. (**Oral**)

S. Ikehata, D. Wipf, Y. Matsushita, and K. Aizawa, "Robust Photometric Stereo using Sparse Regression," *IEEE International Conference on Computer Vision and Pattern Recognition (CVPR)*, 2012.

D. Wipf, "Sparse Estimation with Structured Dictionaries," J. Shawe-Taylor, R.S. Zemel, P. Bartlett, F. Pereira, and K. Weinberger, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2011. (**Spotlight**)

D. Wipf, J. Owen, H. Attias, K. Sekihara, and S. Nagarajan, "Estimating the Location and Orientation of Complex, Correlated Neural Activity using MEG," D. Koller and D. Schuurmans and Y. Bengio and L. Bottou, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2009. (**Spotlight**)

D. Wipf and S. Nagarajan, "Sparse Estimation Using General Likelihoods and Non-Factorial Priors," Y. Bengio, D. Schuurmans, J. Lafferty, C. Williams and A. Culotta, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2009.

D. Wipf and S. Nagarajan, "A New View of Automatic Relevance Determination," J.C. Platt, D. Koller, Y. Singer, and S. Roweis, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2008.

D. Wipf and S. Nagarajan, "Beamforming using the Relevance Vector Machine," *International Conference on Machine Learning (ICML)*, 2007. (**Oral**)

D. Wipf, R. Ramírez, J. Palmer, S. Makeig, and B. Rao, "Analysis of Empirical Bayesian Methods for Neuroelectromagnetic Source Localization," B. Schölkopf, J. Platt, and T. Hoffman, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2007. (**Outstanding Student Paper Award**)

D. Wipf and B. Rao, "Comparing the Effects of Different Weight Distributions on Finding Sparse Representations," Y. Weiss, B. Schölkopf, and J. Platt, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2006. (**Spotlight**)

J. Palmer, D. Wipf, K. Kreutz-Delgado, and B. Rao, "Variational EM Algorithms for Non-Gaussian Latent Variable Models," Y. Weiss, B. Schölkopf, and J. Platt, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2006.

D. Wipf and B. Rao, "ℓ_0-Norm Minimization for Basis Selection," L. Saul, Y. Weiss, and L. Bottou, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2005.

D. Wipf, J. Palmer, and B. Rao, "Perspectives on Sparse Bayesian Learning," S. Thrun, L. Saul, and B. Schölkopf, editors, *Advances in Neural Information Processing Systems (NIPS)*, 2004.

Recent/Upcoming Professional Service

Action Editor, Journal of Machine Learning Research, 2016-present
IEEE Machine Learning for Signal Processing Technical Committee, 2014-present
Editorial Board, Journal of Machine Learning Research, 2013-2016
Area Chair, NIPS, 2014, 2017; ICCV, 2017; ICML, 2018
Program Chair, SPCOM, 2018
Program Committee Member/Reviewer, NIPS, ICML, UAI, CVPR, ICCV, ICLR