about this picture

Yair Weiss

Professor
School of Computer Science and Engineering
The Hebrew University of Jerusalem
91904 Jerusalem, Israel
email: yweiss at cs dot huji dot ac dot il
phone/fax: +972-2-5494540
vita (acrobat)

Research interests
    Human and machine vision. Machine Learning. Bayesian methods. Neural computation.
    see my thesis page for more info.

Education

MSC, Applied Mathematics
Tel-Aviv University, 1993
PhD, Brain and Cognitive Sciences
MIT, 1998 (advisor: Edward Adelson)

Publications

Tighter Linear Program Relaxations for High Order Graphical Models
    Mezuman E., D. Tarlow, A. Globerson and Weiss Y.,
    UAI 2013 PDF

Natural Images, Gaussian Mixtures and Dead Leaves
    Zoran D.. and Weiss Y.,
    NIPS (2012) PDF , Supplemental

Learning about Canonical Views from Internet Image Collections
    Mezuman E. and Weiss Y.,
    NIPS (2012) PDF , Supplemental

Multidimensional Spectral Hashing
    Weiss Y. and Fergus R. and Torralba A.
    ECCV (2012) PDF , Matlab Code , appendix on hashing with kernel trick

Globally Optimizing Graph Partitioning Problems Using Message Passing
    Mezuman E. and Weiss Y.,
    AISTATS (2012) PDF , Code

From Learning Models of Natural Image Patches to Whole Image Restoration
    Zoran D. and Weiss Y.,
    ICCV (2011) PDF , Code

Linear Programming and Variants of Belief Propagation
    Weiss Y., Yanover C. and Meltzer T.
    in Blake, Kohli, Rother (ed): MRFs for Vision and Image Processing (2011) PDF

Efficient Marginal Likelihood Optimization in Blind Deconvolution
    Levin A., Weiss Y., Durand F. and W.T. Freeman
    CVPR 2011 PDF , Code

Belief Propagation
    Weiss Y., and Pearl J.
    Communications of the ACM 2010 PDF

Semantic Label Sharing for Learning with Many Categories
    Fergus, R., Bernal, H., Weiss, Y. and Torralba, A.
    Proc. of the IEEE European Conference on Computer Vision 2010, PDF

The "Tree-Dependent Components" of Natural Images are Edge Filters
    D. Zoran , Y. Weiss
    NIPS 2009 PDF

Semi-Supervised Learning in Gigantic Image Collections
    Rob Fergus, Y. Weiss, Antonio Torralba
    NIPS 2009 pdf

Convergent Message Passing Algorithms: a Unifying View
    T. Meltzer, A. Globerson, Y. Weiss
    UAI 2009 PDF

Scale Invariance and Noise in Natural Images
    D. Zoran , Y. Weiss
    ICCV 2009 PDF , code

Understanding and Evaluating Blind Deconvolution Algorithms
    A. Levin, Y. Weiss, F. Durand, W. T. Freeman
    CVPR 2009 PDF

Informative Sensing
    Hyun Sung Chang and Yair Weiss and William T. Freeman
    Submitted to IEEE Transactions on Info Theory ArXiv:0901.4275v1

Spectral Hashing
    Y. Weiss. and A. Torrlaba and R. Fergus
    NIPS 2008 PDF , Project Page

Human-assisted motion annotation
    C. Liu, W.T. Freeman, E.H. Adelson and Y. Weiss
    CVPR 2008 PDF webpage

Small codes and large databases for recognition
    A. Torralba, R. Fergus and Y. Weiss
    CVPR 2008 PDF

Tightening LP Relaxations for MAP using message passing
    D. Sontag, T. Meltzer, A. Globerson, T. Jaakkola and Y. Weiss
    UAI 2008 PDF

Sparse Regression as a Sparse Eignvalue Problem
    Baback Moghaddam, Amit Gruber, Yair Weiss and Shai Avidan.
    Information Theory and Applications Workshop (ITA 2008) PDF

Latent Topic Models for Hypertext
    A. Gruber, M. Rosen-Zvi and Y. Weiss
    UAI 2008 PDF

Fast Pixel/Part Selection with Sparse Eigenvectors
    Baback Moghaddam, Yair Weiss, Shai Avidan
    ICCV 2007 PDF

Learning Compressed Sensing
    Yair Weiss and Hyun Sung Chang and William T. Freeman
    Allerton 2007 pdf

What makes a good model of natural images ?
    Yair Weiss and William T. Freeman
    CVPR 2007 pdf , Matlab Code , Training Data

MAP Estimation, Linear Programming and Belief Propagation with Convex Free Energies
    Yair Weiss, Chen Yanover, Talya Meltzer
    UAI 2007 acrobat

Minimizing and Learning Energy Functions for Side-Chain Prediction
    Chen Yanover, Ora Schueler-Furman, Yair Weiss
    RECOMB 2007 [acrobat]

Hidden Topic Markov Models
    Amit Gruber, Michal Rosen-Zvi and Yair Weiss,
    In Artificial Intelligence and Statistics (AISTATS), San Juan, Puerto Rico, March 2007. pdf

A closed form solution to Natural Image Matting
    A. Levin D. Lischinski and Y. Weiss
    CVPR 2006 PDF Code&Images

Learning to Combine Bottom-Up and Top-Down Segmentation.
    A. Levin and Y. Weiss
    ECCV 2006 PDF

Incorporating non-motion cues into 3D motion segmentation
    A. Gruber and Y. Weiss
    ECCV 2006 PDF

Generalized spectral bounds for sparse LDA
    Baback Moghaddam, Yair Weiss, Shai Avidan
    ICML 2006 PDF

Spectral Bounds for Sparse PCA: Exact and Greedy Algorithms
    Baback Moghaddam, Yair Weiss, Shai Avidan
    NIPS 2005 [ps.gz][pdf][bibtex] link to MERL TR

Noise and the two-thirds power law
    Uri Maoz, Elon Portugaly, Tamar Flash, Yair Weiss
    NIPS 2005 [ps.gz][pdf][bibtex]

Linear Programming Relaxations and Belief Propagation - an Empirical Study
    Chen Yanover, Talya Meltzer, Yair Weiss
    JMLR Special Issue on Machine Learning and Large Scale Optimization

Globally Optimal Solutions for Energy Minimization in Stereo Vision using Reweighted Belief Propagation
    Talya Meltzer, Chen Yanover, Yair Weiss
    ICCV 2005
    [postscript, acrobat, bibtex]

Constructing Free-Energy Approximations and Generalized Belief Propagation Algorithms
    Yedidia, J.S.; Freeman, W.T.; Weiss, Y.
    IEEE Transactions on Information Theory, Vol. 51, Issue 7, pp. 2282-2312, July 2005 link to MERL TR

Generalized Belief Propagation Receiver for Near-Optimal Detection of Two-Dimensional Channels with Memory,
    O. Shental, A. J. Weiss, N. Shental and Y. Weiss
    IEEE Information Theory Workshop (2004) pdf

Colorization using Optimization.
    A. Levin D. Lischinski and Y. Weiss
    ACM Transactions on Graphics, Aug 2004. pdf , additional results

Multibody Factorization with Uncertainty and Missing data using the EM algorithm
    Amit Gruber and Yair Weiss
    International Conference on Computer Vision and Patern Recognition (CVPR) 2004. pdf

Learning Object Detection from a Small Number of Examples: The Importance of Good Features
    Kobi Levi and Yair Weiss
    International Conference on Computer Vision and Patern Recognition (CVPR) 2004. pdf

Separating Reflections from a Single Image Using Local Features.
    A. Levin, A. Zomet and Y. Weiss
    IEEE Conf. on Computer Vision and Pattern Recognition (CVPR), June 2004, Washington DC pdf

User Assisted Separation of Reflections from a Single Image Using a Sparsity Prior
    A. Levin and Y. Weiss
    Proc. of the European Conference on Computer Vision (ECCV), Prague, May 2004. pdf

Seamless Image Stitching in the Gradient Domain.
    A. Levin, A. Zomet, S. Peleg and Y. Weiss
    Proc. of the European Conference on Computer Vision (ECCV), Prague, May 2004. pdf

Factorization with Uncertainty and Missing Data: Exploiting Temporal Coherence
    Amit Gruber, Yair Weiss
    NIPS 2003 [ps.gz][pdf][bibtex]

Information Bottleneck for Gaussian Variables
    Gal Chechik, Amir Globerson, Naftali Tishby, Yair Weiss
    NIPS 2003 [ps.gz][pdf][bibtex]

Finding the M Most Probable Configurations using Loopy Belief Propagation
    Chen Yanover, Yair Weiss
    NIPS 2003 [ps.gz][pdf] [bibtex]

Pairwise Clustering and Graphical Models
    Noam Shental, Assaf Zomet, Tomer Hertz, Yair Weiss
    NIPS 2003 [ps.gz][pdf][bibtex]

Learning How to Inpaint from Global Image Statistics
    Levin A., Zomet A. and Weiss Y.
    ICCV 2003 (acrobat 322K)

Learning and inferring image segmentations with the GBP typical cut algorithm
    Shental N., Zomet A., Hertz T., and Weiss Y.
    ICCV 2003 acrobat 2.3M

Approximate Inference and Protein Folding
    Yanover C. and Weiss Y.
    NIPS 2002 (postscript 289k) (acrobat 509k)

Maximum Likelihood and the Information Bottleneck
    Slonim N. and Weiss Y.
    NIPS 2002 (postscript 268k) (acrobat 145k)

Learning to perceive transparency from the statistics of natural scenes
    Levin A., Zomet A. and Weiss Y.
    NIPS 2002 (gzipped postscript 1.6M) (acrobat 2.0M) animation

Constructing Free Energy Approximations and Generalized Belief Propagation Algorithms
    Yedidia J.S., Freeman W.T. and Weiss Y.
    submitted to IEEE Tran Info Theory. Also available as MERL TR 2002-35

Motion Illusions as Optimal Percepts
    Weiss Y., Simoncelli E.P. and Adelson E.H.
    Nature Neuroscience June 2002 Volume 5 Number 6 pp 598 - 604 (pdf) , Rhombus demo

Jordan M.I. and Weiss Y.
    Graphical models: probabilistic inference
    In Arbib, M. (ed): Handbook of Neural Networks and Brain Theory. 2nd edition. MIT Press. postscript 457k (2002)

On Spectral Clustering: Analysis and an algorithm
    Ng A.Y., Jordan, M.I., and Weiss Y
    NIPS 2001 (gzipped postscript 149K)

Understanding Belief Propagation and Its Generalizations
    Yedidia J.S., Freeman W.T. and Weiss Y
    IJCAI 2001 Distinguished Lecture track. (acrobat 503K) (ps.gz)

Bethe free energy, Kikuchi approximations and belief propagation algorithms
    Yedidia J.S., Freeman W.T. and Weiss Y
    Longer version of NIPS2000 paper. (gzipped postscript 452K)

Deriving intrinsic images from image sequences
    Weiss Y.
    proceedings ICCV 2001 (acrobat 1943K) (gzipped postscript 1331K) (matlab code 10K)

Generalized Belief Propagation
    Yedidia J.S., Freeman W.T. and Weiss Y
    to appear in NIPS 2000, (link to MERL TR)

Velocity likelihoods in biological and machine vision
    Weiss Y. and Fleet D.J.
    in R. P. N. Rao, B. A. Olshausen, and M. S. Lewicki (eds) Probabilistic Models of the Brain: Perception and Neural Function, MIT Press, 2002. pages 77-96 (gzipped postscript 417K)

Comparing the mean field method and belief propagation for approximate inference in MRFs
    Weiss Y.
    to appear in Saad and Opper (ed) Advanced Mean Field Methods. MIT Press. (gzipped postscript 89K)

On the optimality of solutions of the max-product belief propagation algorithm in arbitrary graphs
    Weiss Y. and Freeman W.T.
    IEEE Transactions on Information Theory 47:2 pages 723-735. (2001) (acrobat 404K)

Correctness of belief propagation in Gaussian graphical models of arbitrary topology.
    Weiss Y. and Freeman W.T.
    Neural Computation 13:2173-2200 (2001). (gzipped postscript 160K) (acrobat 228K) (submitted journal version)

Segmentation using eigenvectors: a unifying view.
    Weiss Y.
    Proceedings IEEE International Conference on Computer Vision p. 975-982 (1999) (gzipped postscript 120K) (acrobat 252K)

Loopy belief propagation for approximate inference: an empirical study.
    Murphy K., Weiss Y. and Jordan M.
    in Laskey K.B. and Prade H. (editors) Proceedings of the Fifteenth Conference on Uncertainty in Artificial Intelligence, Morgan Kaufmann Publishers, San Francisco (1999) (gzipped postscript 75K)

Adventures with gelatinous ellipses: constraints on models of human motion analysis.
    Weiss Y. and Adelson E.H.
    Perception , volume 29 pages 543-566 (2000) (abstract only) quicktime animations

Bayesian Belief Propagation for Image Understanding
    Weiss Y.
    submitted to *SCTV* 1999. (gzipped postscript 297K)

Correctness of local probability propagation in graphical models with loops.
    Weiss Y.
    Neural Computation 12 (1-41) 2000. (gzipped postscript 234K)

Slow and Smooth: a Bayesian theory for the combination of local motion signals in human vision.
    Weiss Y. and Adelson E.H.
    MIT AI Memo 1624 (CBCL Paper 158). (gzipped postscript 971K) (acrobat 628K)

Belief propagation and revision in networks with loops.
    Weiss Y.
    MIT AI Memo 1616 (CBCL Paper 155). Presented in NIPS*97 workshop on graphical models. (gzipped postscript 201K) (acrobat 461K)

Phase transitions and perceptual organization of video sequences.
    Weiss Y.
    in M.I. Jordan, M.J. Kearns and S.A. Solla, editors, Advances in Neural Information Processing Systems 10 850-856 (1998). (gzipped postscript 158K) (acrobat 311K)

Smoothness in Layers: Motion segmentation using nonparametric mixture estimation.
    Weiss Y.
    Proceedings of IEEE conference on Computer Vision and Pattern Recognition 520-527 (1997) (gzipped postscript 313K) (acrobat 148K)

Interpreting images by propagating Bayesian beliefs.
    Weiss Y.
    in: M.C. Mozer, M.I. Jordan and T. Petsche, editors, *Advances in Neural Information Processing Systems 9* 908-915 (1997). (postscript 387K) (acrobat 211K)

Integration and segmentation of nonrigid motion: a computational model.
    Weiss Y. and Adelson E.H.
    ARVO 1996. Investigative Opthamology and Visual Science. 37(3):S742 (1996) (poster handout - postscript 525K)

A unified mixture framework for motion segmentation: incorporating spatial coherence and estimating the number of models.
    Weiss Y. and Adelson E.H.
    Proceedings of IEEE conference on Computer Vision and Pattern Recognition. 321-326. (1996) (postscript 163K) (acrobat 272K)

Motion Estimation and segmentation with a recurrent mixture-of-experts architecture.
    Weiss Y. and Adelson E.H..
    Proceedings of IEEE workshop on Neural Nets for Signal Processing V. 293-303 (1995) (postscript 201K) (acrobat 257K)

Perceptually organized EM: A framework for motion segmentation that combines information about form and motion.
    Weiss Y. and Adelson E.H..
    MIT Media Lab Perceptual Computing Section TR #315 (1994) (postscript 322K)

Representation of similarity as a goal of early visual processing.
    Weiss Y. and Edelman S.
    Network: Computation in Neural Systems 6, 19-41 (1995)

Models of perceptual learning in vernier hyperacuity.
    Weiss Y., Edelman S. and Fahle M.
    Neural Computation 5, 695-718 (1993)

Vision, Hyperacuity
    Edelman S. and Weiss Y.
    In: Arbib, M. (ed): *Handbook of Neural Networks and Brain Theory*
    MIT Press. 1995 (postscript 40K)

Demos

 Perceptual Grouping and Gelatinous Ellipses

---

Tutorials

Approximate inference using loopy belief propagation. Tutorial given at UAI 2001. (gzipped postscript)

Expectation-Maximization for motion segmentation

Professional Activities

AI/Robotics/Vision Colloquium at UCB