YAIR WEISS

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Education	MASSACHUSETTS INSTITUTE OF TECHNOLOGY	Cambridge, MA

Ph.D degree in Computational Neuroscience, May 1998. Thesis under Professor Edward H. Adelson on Bayesian models for perceptual organization and motion analysis.

TEL-AVIV UNIVERSITY   Tel-Aviv, Israel

Master of Science degree in Applied Mathematics, Summa Cum Laude, August 1993.

Experience   MIT DEPT. OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Cambridge, MA

2006–2008
Visiting Scientist.

THE HEBREW UNIVERSITY   Jerusalem, Israel
September 2004 — present
Associate Professor in School of Computer Science and Engineering.

THE HEBREW UNIVERSITY   Jerusalem, Israel
September 2001 – September 2004
Senior lecturer in School of Computer Science and Engineering.

CANADIAN INSTITUTE FOR ADVANCED RESEARCH   Canada
December 2004 - present
Fellow of the program in Neural Computation and Adaptive Perception.

MIT DEPT. OF BRAIN AND COGNITIVE SCIENCES   Cambridge, MA
Summer 2002
Visiting Scientist.

UC BERKELEY   Berkeley, CA
September 1998 – Sept. 2001
Postdoctoral scholar in EECS department.

MIT DEPT. OF BRAIN AND COGNITIVE SCIENCES   Cambridge, MA
1995-1997
Teaching assistant for courses in computational vision, cognitive science, and statistical research methods.

Research Interests

Human and Machine Vision: perceptual organization, motion analysis, propagation of local constraints.

Machine learning and inference: Graphical models, probability propagation, error-correcting codes.

Computational biology: side chain prediction and protein design.

Editorial Positions

Area Chair UAI 2008.

Area Chair ECCV 2008.

Area Chair CVPR 2007.

General Chair NIPS 2005.

Program Chair NIPS 2004.

Area Chair UAI 2004.

Area Chair CVPR 2003.

Program committee, CVPR 2000-present, ICCV 2001-present, NIPS 1998 - present.

Area Chair $NIPS$98.

Awards
Longuet-Higgins Best Paper Award. European Conference on Computer Vision (ECCV 2006).

Student paper award. *Advances in Neural Information Processing Systems 15* (with Anat Levin and Assaf Zomet).

Best poster. Terrorism Countermeasures Research Day. Yissum and the Hebrew University of Jerusalem. (with Kobi Levi).

Alon Fellowship. Israel Council for Higher Education. 2001–2004.

Rosenbaum Fellowship for scientific programme on Neural Networks and Machine Learning. The Isaac Newton Institute for Mathematical Sciences, Cambridge UK. 1997. (declined)

NIGMS traineeship. Massachusetts Institute of Technology 1993-1997.

Honorable mention. *National Defense Science and Engineering Graduate Fellowship.* US Department of the Army. 1993.

Four year merit-based scholarship and stipend. Interdisciplinary program for the fostering of excellence. Tel-Aviv University. 1989-1993.

Dean's list for academic achievement. School of Exact Sciences. Tel-Aviv University. 1993.

Invited Talks

Invited talk, Algorithms Inference and Statistical Physics. Los Alamos National Labs. (2007)

Invited plenary talk. Japanese society for Information Based Inductive Sciences. 2005.

Invited plenary talk. Canadian Workshop on Information Theory. 2003.

Invited talk. The Rank Prize mini-symposium on "The Probabilistic Brain". 2003.

Invited plenary talk. Mathematics and Image Analysis symposium. 2002.

Invited tutorial. 15th conference on Neural Information Processing Systems. 2002.

Invited tutorial. 17th conference on Uncertainty in Artificial Intelligence. 2001.

Invited talk. Workshop on vision: computational and biological approaches. Mathematisches Forschungsinstitut Oberwolfach. 2001.

Invited talk. Workshop on statistical physics and capacity approaching codes. International Center for Theoretical Physics. 2001.

Invited talk. Workshop on context and adaptation in statistical theories of vision. NIPS*99.

Invited talk. Workshop on advanced mean field methods. NIPS*99.

Invited plenary talk. Optical Society of America annual meeting 1999.

Invited talk. Program on codes, systems and graphical models. Institute for Mathematics and its Applications, University of Minnesota.

Journal Publications

Shental O., Shental N., Shamai S., Kanter I., Weiss A.J. and Weiss Y., "Discrete-Input Two-Dimensional Gaussian Channels with Memory: Estimation and Information Rates via Graphical Models and Statistical Mechanics", IEEE Transactions on Information Theory, Vol. 54(4) (2008).

Levin A., Lischinski D., and Weiss Y. "A Closed Form Solution to Natural Image Matting". IEEE Trans. Pattern Analysis and Machine Intelligence, to appear.

Levin A. and Weiss Y. "User Assisted Separation of Reflections from a Single Image Using a Sparsity Prior". IEEE Trans. Pattern Analysis and Machine Intelligence 29(9): 1647–1654 (2007).

Zomet A., Levin A., Peleg S. and Weiss Y. "Seamless image stitching in the gradient domain". IEEE Trans. Image Processing, Vol. 15, No. 4, April 2006, pp. 969-977.

Chechik G., Globerson A., Tishby N. and Weiss Y. "The Gaussian Information Bottleneck". Journal of Machine Learning 6(Jan):165–188, 2005.

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

Yedidia J.S., Freeman W.T. and Weiss Y. "Constructing free energy approximations and generalized belief propagation algorithms". IEEE Transaction on Information Theory Vol. 51, no. 7, pp. 2282-2313. (2005).

Weiss Y., Simoncelli E.P. and Adelson E.H.,"Motion Illusions as Optimal Percepts", *Nature Neuroscience* 5(6):598 – 604 (2002)

McDermott J. and Weiss Y. and Adelson E.H., "Beyond Junctions: nonlocal form constraints on motion interpretation" *Perception* 30(8):905-925. (2001)

Weiss Y. and Freeman W.T., "On the optimality of solutions of the max-product belief propagation algorithm". IEEE Transactions on Information Theory 47(2): 723-735 (2001).

Weiss Y. and Freeman W.T., "Correctness of belief propagation in Gaussian graphical models of arbitrary topology". *Neural Computation* 13:2173-2200 (2001).

Weiss Y., "Correctness of local probability propagation in graphical models with loops". *Neural Computation* 12 1-41 (2000).

Weiss Y. and Adelson E. H. , "Adventures with gelatinous ellipses: Constraints on models of human motion analysis." *Perception* 29:543-566 (2000).

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

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

Refereed Conference Papers

B. Moghaddam, Y. Weiss, S. Avidan, " Fast Pixel/Part Selection with Sparse Eigenvectors", International Conference on Computer Vision (ICCV) 2007.

Y. Weiss , H.S. Chang and W. T. Freeman "Learning Compressed Sensing" $45th$ Allerton Conference on Control Communication and Computing (2007)

Y. Weiss and W. T. Freeman, "What makes a good model of natural images ?" Computer Vision and Pattern Recognition (CVPR) 2007.

Y. Weiss, C. Yanover and T. Meltzer "MAP Estimation, Linear Programming and Belief Propagation with Convex Free Energies", Uncertainity in Artificial Intelligence (UAI) 2007.

C. Yanover, O. Schueler-Furman, Y. Weiss "Minimizing and Learning Energy Functions for Side-Chain Prediction" Research in Computational Molecular Biology (RECOMB) 2007.

A. Gruber, M. Rosen-Zvi and Y. Weiss, "Hidden Topic Markov Models", In Artificial Intelligence and Statistics (AISTATS), San Juan, Puerto Rico, March 2007.

A. Levin D. Lischinski and Y. Weiss, "A closed form solution to Natural Image Matting". Computer Vision and Pattern Recognition (CVPR) 2006.

A. Levin and Y. Weiss, "Learning to Combine Bottom-Up and Top-Down Segmentation" European Conference on Computer Vision (ECCV) 2006.

A. Gruber and Y. Weiss, "Incorporating non-motion cues into 3D motion segmentation" European Conference on Computer Vision (ECCV) 2006.

B. Moghaddam, Y. Weiss, S. Avidan "Generalized spectral bounds for sparse LDA". International Conference on Machine Learning (ICML) 2006.

U. Maoz, E. Portugali, T. Flash and Y. Weiss "Noise and the two-thirds power law", in Advances in Neural Processing Systems (NIPS) 2005.

B. Moghaddam, Y. Weiss and S. Avidan "Spectral Bounds for Sparse PCA: Exact and Greedy Algorithms". in Advances in Neural Processing Systems (NIPS) 2005.

T. Meltzer, C. Yanover and Y. Weiss, "Globally optimal solutions for energy minimization in stereo vision using reweighted belief propagation". in proceedings International Conference on Computer Vision, Beijing (2005).

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

Gruber A. and Weiss Y. "Multibody factorization with uncertainty and missing data using the EM algorithm". Proceedings of IEEE conference on Computer Vision and Pattern Recognition. 2004.

Levi K. and Weiss Y. "Learning object detection from a small number of examples: the importance of good features". Proceedings of IEEE conference on Computer Vision and Pattern Recognition 2004.

Levin A., Zomet A. and Weiss Y. "Separating reflections from a single image using local features". Proceedings of IEEE conference on Computer Vision and Pattern Recognition 2004.

Zomet A., Levin A., Peleg S. and Weiss Y., "GIST: image stitching in the gradiet domain". Proceedings of the European Conference on Computer Vision. 2004.

Levin A. and Weiss Y.,"User assisted separation of reflections from a single image using a sparsity prior ". Proceedings of the European Conference on Computer Vision. 2004.

Gruber A. and Weiss Y.,"Factorization with Uncertainty and Missing Data: Exploiting Temporal Coherence". to appear in *Advances in Neural Information Processing Systems 16* MIT Press.

Yanover C. and Weiss Y., "Finding the M Most Probable Configurations using Loopy Belief Propagation". to appear in *Advances in Neural Information Processing Systems 16* MIT Press. 2003

Chechik G., Globerson A., Tishby N. and Weiss Y. "Information Bottleneck for Gaussian Variables". to appear in *Advances in Neural Information Processing Systems 16* MIT Press. 2003

Shental N., Zomet A., Hertz T., and Weiss Y. "Pairwise Clustering and Graphical Models". to appear in *Advances in Neural Information Processing Systems 16* MIT Press. 2003

Levin A., Zomet A. and Weiss Y., "Learning How to Inpaint from Global Image Statistics", in proceedings International Conference on Computer Vision, Nice, France (2003).

Shental N., Zomet A., Hertz T., and Weiss Y. "Learning and inferring image segmentations with the GBP typical cut algorithm". in proceedings International Conference on Computer Vision, Nice, France (2003).

Slonim N. and Weiss Y. "The information bottleneck and mixture models". in S. Becker, S. Thrun, and K. Obermayer (ed) *Advances in Neural Information Processing Systems 15* MIT Press. (2003).

Levin A., Zomet A. and Weiss Y. "Learning to perceive transparency from the statistics of natural scenes". S. Becker, S. Thrun, and K. Obermayer (ed) *Advances in Neural Information Processing Systems 15* MIT Press. (2003).

Yanover C. and Weiss Y. "Approximate inference and protein folding", S. Becker, S. Thrun, and K. Obermayer (ed) *Advances in Neural Information Processing Systems 15* MIT Press. (2003).

Ng A. and Jordan M.I. and Weiss Y. "On Spectral Clustering: analysis and and algorithm". In In T. Dietterich, S. Becker and Z. Ghahramani (Eds.), *Advances in Neural Information Processing Systems 14* MIT Press. (2002)

Yedidia J.S., Freeman W.T. and Weiss Y., "Understanding Belief Propagation and Its Generalizations". In IJCAI 2001, Distinguished lecture track.

Yedidia J.S., Freeman W.T. and Weiss Y.,"Bethe free energy, Kikuchi approximations and belief propagation algorithms". In Proc. of IEEE workshop on Statistical and Computational Theories of Vision, Vancouver, CA, July 2001.

Murphy K. and Weiss Y. "The factored frontier algorithm for approximate inference in DBNs". In Proceedings of the 17th conference on Uncertainty in Artificial Intelligence. Morgan Kaufmann. (2001)

Weiss Y., "Deriving Intrinsic Images from Image Sequences", in: Proceedings IEEE International Conference on Computer Vision, p. 68-76 (2001).

Yedidia J., Freeman W.T. and Weiss Y., "Generalized Belief Propagation", in T,K. Leen, T.G. Dietterich and V. Tresp, editors *Advances in Neural Information Processing Systems 13* (2001).

Weiss Y. and Freeman W.T., "Correctness of belief propagation in Gaussian graphical models of arbitrary topology", in S. A. Solla, T. K. Leen, and K-R. Mller, editors *Advances in Neural Information Processing Systems 12* (2000).

Weiss Y., "Segmentation using eigenvectors: a unifying view", in: Proceedings IEEE International Conference on Computer Vision, p. 975-982 (1999).

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

Weiss Y., "Phase transitions and perceptual organization of video sequences." in: M.I. Jordan, M.J. Kearns and S.A. Solla, editors, *Advances in Neural Information Processing Systems 10* p. 850-856 (1998).

Weiss Y., "Smoothness in Layers: motion segmentation using nonparametric mixture estimation". Proceedings IEEE conference on Computer Vision and Pattern Recognition 520-527 (1997).

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

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

Weiss Y. and Adelson E.H., "Motion estimation and segmentation with a recurrent mixture-of-experts architecture." Proceedings of IEEE workshop on Neural Nets for Signal Processing V. 293-303 (1995)

Books   Lawrence K. Saul, Yair Weiss, and Le'on Bottou (ed.), "Advances in Neural Information Processing Systems 17", MIT Press (2005).

Book Chapters

Fleet D.J. and Weiss Y., "Optical Flow Estimation", in N. Paragios, O. Faugeras, and Y. Chen (ed) *Handbook of Mathematical Models in Computer Vision.* Springer. 2005.

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

Weiss Y., "Comparing the Mean Field method and Belief Propagation for approximate inference in MRFs". In Saad D. and Opper M. (ed) *Advanced Mean Field Methods.* MIT Press (2001).

Weiss Y. and Fleet D.J., "Velocity likelihoods in biological and machine vision". In Rao R. and Sejnowski T. (ed): *Statistical theories of the cortex* MIT Press. (2000)

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