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

UC Berkeley — Berkeley, CA
September 1998 – present
Postdoctoral scholar in EECS department.

NECI Research Center — Princeton, NJ
January 1999
Consultant in CS division.

Xerox Palo Alto Research Center — Palo-Alto, CA
January 1997
Consultant in Image Understanding Area.

MIT Dept. of Brain and Cognitive Sciences — Cambridge, MA
1995-1997
Teaching assistant for courses in computational vision, cognitive science, and statistical research methods.

MIT Media Lab — Cambridge, MA
1993-1995
Research assistant in Perceptual Computing section.

Israeli Defense Forces — Israel
1985-1989
Military service. Rank of Lieutenant.

Research Interests

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

Neural Computation: Bayesian methods, probability propagation, error-correcting codes.

Journal Publications

McDermott J., Weiss Y. and Adelson E. H., "The computation of occlusion for motion perception". In preparation.

Weiss Y. and Adelson E. H. , "Slow and Smooth: a Bayesian theory for the combination of local motion signals in human vision". In preparation.

McDermott J., Weiss Y. and Adelson E. H., "Local and global form constraints in motion integration". Submitted (2000).

Freeman W.T. and Weiss Y., "On the fixed points of the max-product algorithm". Submitted to *IEEE transactions on Information Theory* (1999).

Weiss Y. and Freeman W.T., "Correctness of belief propagation in Gaussian graphical models of arbitrary topology". submitted to *Neural Computation* (1999).

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." To appear in *Perception* (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

Weiss Y. and Freeman W.T., "Correctness of belief propagation in Gaussian graphical models of arbitrary topology", to appear 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)

Book Chapters

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)

Technical Reports

Weiss Y. and Freeman W.T., "Correctness of belief propagation in Gaussian graphical models of arbitrary topology". UC Berkeley CS Technical Report UCB–CSD-99-1046 (1999).

Weiss Y. and Adelson E. H. , "Slow and Smooth: a Bayesian theory for the combination of local motion signals in human vision". MIT AI memo 1624 (CBCL paper 158) (1998).

Weiss Y., "Belief propagation and revision in networks with loops." MIT AI Memo 1616 (CBCL paper 155) (1997)

Weiss Y. and Adelson E.H., "Perceptually Organized EM: A framework for motion segmentation that combines information about form and motion." MIT Media Lab Perceptual Computing Section TR 315 (1994)

Weiss Y. "Does the visual system use Gabor wavelets?" Eskenazi Institute of Computer Science Technical Report 268/92. Tel Aviv University. 1992.

Weiss Y., Edelman S., Fahle M., and Poggio T. "Exploring varieties of perceptual learning with a biologically motivated HyperBF network model of vernier hyperacuity." Technical Report CS91-21. The Weizmann Institute of Science. 1991.

Abstracts

Weiss Y., and Malik J. "Structure and motion of stereokinetic displays", *Investigative Opthalmology and Vision Science*, 40/4 (1999)

Weiss Y., and Adelson E.H. "Bayesian Common Fate". *Investigative Opthalmology and Vision Science*, 39/4 (1998)

McDermott J., Weiss Y., and Adelson E.H. "Two modes of interaction in the analysis of motion and occlusion.", *Investigative Opthalmology and Vision Science*, 39/4 (1998)

Weiss Y., and Adelson E.H. "Vector averaging as Bayesian IOC." *Investigative Opthalmology and Vision Science*, 38/4 (1997)

McDermott J., Weiss Y., and Adelson E.H. "Surface perception and motion integration.", *Investigative Opthalmology and Vision Science*, 38/4 (1997)

Weiss Y., and Adelson E.H. "Adaptive Robust Windows: a model for the selective integration of motion signals in human vision." Fifth Annual Computational Neuroscience Meeting (1996).

Weiss Y., and Adelson E.H. "Interaction of multiple surface cues in motion grouping.", *Perception* Vol. 25 supplement (1996)

Weiss Y., and Adelson E.H. "Integration and segmentation of nonrigid motion: a computational model." *Investigative Opthalmology and Vision Science*, 37/3 (1996)

Weiss Y., and Adelson E.H. "Adventures with gelatinous ellipses." *Perception* Vol. 24 supplement (1995).

Weiss Y., and Adelson E.H. "Integration and segmentation of nonrigid motion." *Investigative Opthalmology and Vision Science*, 36/4 (1995)

Weiss Y., and Edelman S. "Representation with receptive fields: gearing up for recognition." *Investigative Opthalmology and Vision Science*, 35/4 (1994)

Invited Talks

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

Workshop on advanced mean field methods. NIPS*99.

Optical Society of America annual meeting 1999.

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

Departmental colloquium, Hebrew University, CS Department.

Workshop on statistical models of the cortex. NIPS*98.

Oxyopia colloquium. UC Berkeley.

Statistics, Machine Learning and AI seminar. AT&T Research. Murray Hill, New Jersey.

Vision seminar. David Sarnoff Research Center. Princeton, New Jersey.

AI colloquium at CMU, School of Computer Sciences.

Vision seminar at NECI Research. Princeton, New Jersey.

Workshop on Generative Models and Computational Neuroscience. Toronto. 1998

Computer Science Colloquium at Harvard University, Computer Science Department.

Vision Colloquium at Hebrew University. Department of Computer Science.

Vision Colloquium at Weizmann Institute. Department of Computer Science and Applied Mathematics.

Robotics Colloquium at Harvard University, Computer Science Department.

AI Colloquium at University of Toronto, Computer Science Department.

Neuron Colloquium at University of Toronto, Computer Science Department.

AI Colloquium at University of California, Berkeley, Computer Science Department.

SAPS Colloquium at Stanford University, Psychology Department.

Lecture at Boston University, Biomedical Engineering Department.

Seminar at Microsoft Research, Redmond, Wa.

Seminar at Hewlett-Packard Laboratories, Palo Alto, CA.

Seminar at Apple Research Laboratories, Cupertino, CA.

Seminar at Interval Research Corporation, Palo Alto, CA.

Seminar at Xerox Palo Alto Research Center, Palo Alto, CA.

Reviews

Advances in Neural Information Processing. (NIPS*96,NIPS*97)

Journal of AI research

Vision Research.

Neural Computation.

IEEE Transactions on Pattern Analysis and Machine Intelligence

IEEE Transactions on Information Theory

IEEE Transactions on Image Processing

IEEE Transactions on Neural Networks

IEEE Workshop on Visual Scene Representation, 1995.

Professional Activities

Program committee, CVPR 2000.

Program committee area chair for vision, $NIPS$*98.

Organizer of AI/Robotics/Vision colloquium series. UC Berkeley.

Organizer of Perceptual Science colloquium series, Massachusetts Institute of Technology, 1996-1998.

Awards

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.

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.