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# Curriculum Vitae - Max Welling

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Max Welling  
Department of Computer Science  
University of Toronto  
6 King's College Road  
Toronto, M5S 3G5 Canada

Email: [welling@cs.toronto.edu](mailto:welling@cs.toronto.edu)  
URL: <http://www.cs.toronto.edu/~welling/>  
Phone: (416) 946 8483  
Fax: (416) 978 1931  
Office: Pratt 384

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## Education

1987-1993  
MS physics  
Thesis: Asymptotically Flat Universes have Positive Total Energy.

Utrecht University  
Supervisor: Prof. G. 't Hooft  
Utrecht, Netherlands

1993-1998  
PhD physics  
Thesis: Gravity in 2+1 Dimensions.

Utrecht University  
Supervisor: Prof. G. 't Hooft  
Utrecht, Netherlands

## Teaching

1987-1998  
Assistant

Utrecht University  
Physics for biologists  
Statistical mechanics  
Analysis and algebra  
Quantum mechanics  
Electrodynamics  
Classical mechanics  
Utrecht, Netherlands

Spring 2000  
Instructor

Caltech  
Learning Systems  
Pasadena, USA

Autumn 2000  
Instructor

University College London  
Unsupervised Learning  
London, UK

## Employment

1998-2000 Postdoctoral Fellow	Caltech Vision Lab Supervisor: Prof. P. Perona	Pasadena, USA
2000-2001  Postdoctoral Fellow	Gatsby Computational Neuroscience Unit Supervisor: Prof. G.E. Hinton	London, UK
2001-2003  Postdoctoral Fellow	University of Toronto Dept. Computer Science Supervisor: Prof. G.E. Hinton	Toronto, Canada

## Organizer Workshops

May 2001  Workshop on Inference and Learning	Gatsby Computational Neuroscience Unit	London, UK
December 2002  Propagation Algorithms on Graphs with Cycles: Theory and Applications	NIPS-2002-workshops	Whistler, Canada

## Fellowships, Awards

1998-2000 Sloan Research Fellowship	Caltech Vision Lab	Pasadena, USA
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## Supervision of Research

Sept. 2002-June 2003  Peter-Vincent Gehler, visiting student	University of Toronto Dept. Computer Science	Toronto, Canada
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# Publications

## Physics-Journal

- M. Welling, *Gravity in 2+1 dimensions as a Riemann-Hilbert problem*, 1996, Class. Quant. Grav. 13, pp. 653.
- M. Welling and M. Bijlsma, *Pauli-Lubanski scalar in the polygon approach to 2+1 dimensional gravity*, 1996, Class. Quant. Grav. 13, pp. 1769.
- M. Welling, *The torus universe in the polygon approach to 2+1 dimensional gravity*, 1997, Class. Quant. Grav. 14, pp. 929.
- M. Welling, *Two particle quantum mechanics in 2+1 gravity using non-commuting coordinates*, 1997, Class. Quant. Grav. 14, pp. 3313.
- M. Welling, *Winding solutions for the two particle system in 2+1 gravity*, 1998, Class. Quant. Grav. 15, pp. 613.
- M. Welling, *Explicit solutions for point particles and black holes in spaces of constant curvature in 2+1 dimensional gravity*, 1998, Nucl. Phys. B pp. 515.
- H.J. Matschull and M. Welling, *Quantum mechanics of a point particle in 2+1 dimensional gravity*, 1998, Class. Quant. Grav. 15, pp. 2981.

## Physics-Conference

- M. Welling, *Some approaches to 2+1 dimensional gravity coupled to point particles*, 1996, Proceedings of the 7th summer school: Theoretical and Mathematical Physics, Kazan, Russia.
- M. Welling, *One particle quantum mechanics in 2+1 gravity using non commuting coordinates*, 1997, Nucl. Phys. B (Proc. Suppl.) 57, pp. 346.

## Machine Learning-Journal

- M. Welling and M. Weber, *A constrained EM algorithm for independent component analysis*, 2001, Neural Computation 13 (3), pp. 677-689.
- M. Welling and M. Weber, *Positive tensor factorization*, 2001, Pattern Recognition Letters 22 (12), pp. 1255-1261.
- M. Welling and Y.W. Teh, *Approximate inference in Boltzmann machines*, 2003, Artificial Intelligence 143 (1), pp.19-50.
- M. Welling and Y.W. Teh, *Propagation rules for linear response estimates of joint pairwise probabilities*, 2003, submitted to neural computation.
- Y.W. Teh, M. Welling, S. Osindero and G. Hinton, *Energy-based models for sparse overcomplete representations*, submitted to Journal Machine Learning Research.
- Max Welling, *Inferring offset-normal shape distributions with EM*, submitted to Biometrika.

## Machine Learning-Conferences (refereed)

- M. Weber, M. Welling and P. Perona, *Unsupervised learning of models for visual object class recognition*, 1999, Proceedings of the 6th Annual Joint Symposium on Neural Computation, JNSC99, Pasadena.
- M. Welling and M. Weber, *Independent component analysis of incomplete data*, 1999, Proceedings of the 6th Annual Joint Symposium on Neural Computation, JNSC99, Pasadena.

- M. Weber, M. Welling and P. Perona, *Towards automatic discovery of object categories*, 2000, Proc. IEEE Comp. Soc. Conf. Comp. Vis. and Pat. Rec., CVPR2000, Hilton Head Island.
- M. Weber, W. Einhauser, M. Welling and P. Perona, *Viewpoint-invariant learning and detection of human heads*, 2000, Proc. 4th Int. Conf. Autom. Face and Gesture Rec., FG2000, Grenoble.
- M. Weber, M. Welling and P. Perona, *Unsupervised learning of models for recognition*, 2000, Proc. 6th Europ. Conf. Comp. Vis., ECCV2000, Dublin.
- M. Welling and Y.W. Teh, *Belief optimization for binary networks: A stable alternative to loopy belief propagation*, 2001, UAI2001, Seattle, Washington.
- Y.W. Teh and M. Welling, *The unified propagation and scaling algorithm*, 2001, Neural Information Processing Systems 14, NIPS2001, Vancouver.
- G.E. Hinton, M. Welling, Y.W. Teh and S.K. Osindero, *A new view of ICA*, 2001, Int. Conf. on Independent Component Analysis and Blind Source Separation, ICA2001, San Diego.
- M. Welling and G. Hinton, *A new learning algorithm for mean field Boltzmann machines*, 2001, Int. Conf. Artificial Neural Networks, ICANN2002, Madrid.
- M. Welling, G. Hinton and S. Osindero, *Learning sparse topographic representations with products of student-t distributions*, 2002, Neural Information Processing Systems 15, NIPS2002, Vancouver.
- M. Welling, R. Zemel and G. Hinton, *Self-supervised boosting*, 2002, Neural Information Processing Systems 15, NIPS2002, Vancouver.
- Y.W. Teh and M. Welling, *On improving the efficiency of the iterative proportional fitting procedure*, 2003, Artificial Intelligence and Statistics, AISTATS2003, Key West.

### Book Reviews

- M. Welling, *Advanced mean field methods, theory and applications*, eds. M. Opper and D. Saad, 2002, The Computer Journal 45 (2), pp. 257-258.

### Books

- S. Ikeda, T. Tanaka and M. Welling, *Propagation algorithms on graphs with cycles, theory and applications*, in preparation.

### Technical Reports

- M. Welling, *Robust cumulant expansions for probability density estimation*, 1999, Caltech.
- Y.W. Teh and M. Welling, *Passing and bouncing messages for generalized inference*, 2001, Gatsby Computational Neuroscience Unit (a later version was published in NIPS 2001).
- M. Welling and G. Hinton, *A new learning algorithm for mean field Boltzmann machines*, 2001, Gatsby Computational Neuroscience Unit (a later version was published in ICANN 2002).
- M. Welling and G. Hinton, *Approximate contrastive free energies for learning in undirected graphical models*, 2001, Gatsby Computational Neuroscience Unit.
- M. Welling, *Robust higher order statistics*, 2002, University of Toronto.