Curriculum Vitae

Paul W. Munro

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*University of Pittsburgh*

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# Education

**June 1983**: Ph.D. Physics Brown University Providence RI

**June 1979**: Sc.M. Physics Brown University Providence RI

**August 1977**: B.S. Physics Rensselaer Polytechnic Institute Troy NY

# Book Chapters

P. Munro (2010) Backpropagation. In C. Sammut and G.I. Webb (Eds) *Encyclopedia of Machine Learning*. Springer: Berlin.

1. P. Munro (2002) Coding Techniques. In: *Computer Sciences Vol. 2: Software and Hardware.* Roger R. Flynn, Ed., Macmillan Reference USA: New York

P. Munro (2002) Neural networks. In: *Computer Sciences Vol. 3: Social Applications.* Roger R. Flynn, Ed., Macmillan Reference USA: New York

P. Munro (2002) Backpropagation. In: *Encyclopedia of Cognitive Science*, Lynn Nadel, ed., Macmillan: London.

T. Ghiselli-Crippa, S. C. Hirtle, and P. Munro (1996) Connectionist models in spatial cognition. In: *The Construction of Cognitive Maps.* J. Portugali, ed. Kluwer: Netherlands.

P. Munro (1994) Learning in Neural Networks. In: *Human-Machine Communication for Educational Systems Design.* Maddy D. Brouwer Janse, Thomas L. Harrington, eds. Springer-Verlag: Berlin.

P. Munro (1991) Neural Networks. In: *McGraw-Hill Yearbook of Science and Technology 1992.* McGraw-Hill Inc.: New York, NY.

G. W. Cottrell, P. Munro, and D. Zipser (1989) Image compression by back propagation: An example of extensional programming. In: *Models of Cognition: A Review of Cognitive Science. v1* Noel E. Sharkey, ed. Ablex: Norwood, NJ. [Also presented at the Ninth Ann Meeting of the Cognitive Science Society, pp. 461-473]

P. W. Munro (1986) State-dependent factors influencing neural plasticity: A partial account of the critical period. In: *Parallel Distributed Processing: Explorations in the Microstructure of Cognition.* J. L. McClelland, D. E. Rumelhart, eds. MIT Press: Cambridge, MA.

L. N Cooper, P. W. Munro, and C. L. Scofield (1985) Neuron selectivity: Single neuron and neuron networks. In: *Synaptic Modification, Neuron Selectivity, and Nervous System Organization.* W. B. Levy, J. A. Anderson, S. Lehmkuhle, eds. Erlbaum: Hillsdale, NJ.

# Edited Volumes

Proceedings of the Sixth International Conference on Cognitive Modeling (ICCM 2004), Marsha Lovett, Christian Schunn, Christian Lebiere, Paul Munro, eds,, Lawerence Erlbaum: Mahwah NJ

Rosenstein, Gregory (1991) *Income and Choice in Biological Control Systems: A Framework for Understanding the Function and Dysfunction of the Brain.* English translation edited by Paul Munro in cooperation with Tom Wallsten. Erlbaum: Hillsdale, NJ.

# Journal Publications

L. C. Udeigwe, P. W. Munro, G. B. Ermentrout (2017) Emergent dynamical properties of the BCM rule., *J. Math. Neurosci.*, 7:2.

L. C. Udeigwe, G. B. Ermentrout, P. W. Munro (2013) Oscillations and Chaos in the dynamics of the BCM learning rule. *BMC Neuroscience.* 14 (Suppl 1): 285-286.

G. Hernández, P. Munro, and J. Rubin (2003) The effect of spike redistribution in a reciprocally connected pair of neurons wth spike-timing dependent plasticity. *Neurocomputing.* 52: 347-353

P. Munro and G. Hernández (2001) Time-dependent LTD as a stability factor. *Neurocomputing.* 38: 775-780.

B. Parmanto, P. W. Munro, and H. R. Doyle (1996) Reducing variance of committee prediction with resampling techniques. *Connection Science.* 8: 405-425.

H. R. Doyle, B. Parmanto, P. W. Munro, I. R. Marino, L. Aldrighetti, C. Doria, J. McMichael, and J. J. Fung (1995) Building clinical classifiers using incomplete observations - A neural network ensemble for hepatoma detection in patients with cirrhosis. *Methods of Information in Medicine.* 34: 1442.

P. W. Munro, Cynthia Cosic, and Mary Tabasko (1991) A network for encoding, decoding, and translating locative prepositions. *Connection Science.* 3: 225-240.

P. W. Munro and J. A. Anderson (1988) Tools for connectionist modeling: The dynamical systems methodology. *Behavior Research Methods, Instruments, and Computers.* 20: 276-281

P. W. Munro (1984) A Model for Generalization and Specification by Single Neurons. *Biological Cybernetics*. 51:169-179.

E. L. Bienenstock, L. N Cooper, and P. W. Munro (1982) Theory for the Development of Neuron Selectivity: Orientation Specificity and Binocular Interaction in Visual Cortex. *Journal of Neuroscience.* 2:32-48.

# Conference Proceedings

1. P. Munro (2016) A Framework for Combining Unsupervised and Supervised Learning Procedures, Bobrowski, L., Valenta, Z,, Enachescu, C. (Eds.) (2016). *Lecture Notes of the ICB Seminar: Statistics and Clinical Practice*. Warsaw PL: Polish Academy of Sciences.
2. P. Munro (2016) A Model of Language-Guided Concept Formation using a Common Framework for Unsupervised and Supervised Learning, Papafragou, A., Grodner, D., Mirman, D., & Trueswell, J.C. (Eds.) (2016). *Proceedings of the 38th Annual Conference of the Cognitive Science Society*. Austin, TX: Cognitive Science Society.
3. Yefei Peng, Paul Munro, Ming Mao (2010) Ontology Mapping Neural Network: An Approach to Learning and Inferring Correspondences Among Ontologies, In the Proceedings of the 9th International Semantic Web Conference (ISWC), pp. 65-68, Shanghai, China.
4. P. Munro and Y. Peng (2009) Analogical Mapping and inference in overlapping networks. *New Frontiers in Analogy Research.* Kokinov, B., Holyoak, K., Gentner, D., eds. New Bulgarian University Press.

Yefei Peng, Paul Munro, Ming Mao (2009) Learning to Map Ontologies with Neural Network, In the Proceedings of the 4th International Workshop on Ontology Matching (OM) at 8th International Semantic Web Conference (ISWC), Washington, DC

Yefei Peng, Paul Munro (2009) Learning mappings with Neural Network, In the Proceedings of the 2009 International Conference on Artificial Intelligence, Las Vegas, NV

P. W. Munro (2008) Learning structurally analogous tasks. *Artificial Neural Networks – ICANN 2008*. Lecture Notes in Computer Science. Springer: Berlin/Heidelberg.

J. Bao and P. Munro (2006) Structural Mapping with Identical Elements Neural Network. *2006 International Joint Conference on Neural Networks.* (IJCNN 2006) IEEE: Piscataway NJ

Q. Ye and P. Munro (2006) Improving a Neural Network Classifier Ensemble with Multi-Task Learning. *2006 International Joint Conference on Neural Networks.* (IJCNN 2006) IEEE: Piscataway NJ

Q. Ye and P. Munro (2006) Ensemble selection using diversity networks. *Proceedings of 2006 International Conference on Data Mining.* CSREA Press. **Winner – Best Student Paper Award (**http://www.dmin-2006.com/awards.htm)

P. Munro and J. Bao (2005) A connectionist implementation of identical elements. *Twenty Seventh Ann. Conf. Cognitive Science Society Proceedings*. Lawerence Erlbaum: Mahwah NJ

Y. Peng and P. Munro (2005) Learning arbitrary functions with spike-timing dependent plasticity learning rule, *Proceedings of 2005 International Conference on Neural Networks and Brain*, Beijing, China.

P. Munro and S. Sanguansintukul (2002) Treatment optimization with a neural control system. In: L. Wang, J. C. Rajapakse, S. Halgamuge, K. Fukushima, S-Y Lee, T. Furuhashi, J-H Kim, X. Yao, eds. *International Conference on Neural Information Processing Systems* (ICONIP ’02) IEEE: Piscataway NJ

G. Hernández, P. Munro, and J. Rubin (2002) Mapping from the spike domain to the rate-based domain. In: L. Wang, J. C. Rajapakse, S. Halgamuge, K. Fukushima, S-Y Lee, T. Furuhashi, J-H Kim, X. Yao, eds. *International Conference on Neural Information Processing Systems* (ICONIP ’02) IEEE: Piscataway NJ

P. Munro and S. Sanguansintukul (2002) A Neural Network Approach to Treatment Optimization, *AMIA 2002 Symposium Proceedings*, American Medical Informatics Association.

P. W. Munro and G. Cottrell (2001) Connectionist Network Interactions between Frequency Effects and Age of Acquisition Effects in a Connectionist Network. Twenty Third Ann. Conf. Cognitive Science Society Proceedings. pp. 703-708. Lawerence Erlbaum: Mahwah NJ.

P. W. Munro and G. Hernández (2000) LTD facilitates learning in a noisy environment. In: S. A. Solla, T. K. Leen, K-R. Müller, eds. *Advances in Neural Information Processing Systems 12.* MIT Press: Cambridge, MA.

T. Ghiselli-Crippa and P. W. Munro (2000) Effects of spatial and temporal contiguity on the acquisition of spatial information. In: S. A. Solla, T. K. Leen, K-R. Müller, eds. . *Advances in Neural Information Processing Systems 12.* MIT Press: Cambridge, MA.

P. W. Munro and G. Hernández (1999) An LTP/LTD perspective on learning rules. In: T. Gedeon, P. Wong, S. Halgamuge, N. Kasabov, D. Nauck, K. Fukushima, eds. *International Conference on Neural Information Processing Systems*. IEEE: Piscataway NJ

P. W. Munro and B. Parmanto (1997) Competition among networks improves committee performance. In: M. C. Mozer, M. I. Jordan, T. Petsche, eds. *Advances in Neural Information Processing Systems 9.* MIT Press: Cambridge, MA.

B. Parmanto, P. W. Munro, H. R. Doyle (1996) Improving committee diagnosis with resampling techniques. In: D. S. Touretzky, M. C. Mozer, M. E. Hasselmo, eds. *Advances in Neural Information Processing Systems 8.* MIT Press: Cambridge, MA.

B. Parmanto, P. W. Munro, H. R. Doyle, C. Doria, L. Aldrighetti, I. R. Marino, S. Mitchell, J. J. Fung (1994) Neural Network Classifier for Hepatoma Detection. 1994 World Congress on Neural Networks.

T. Ghiselli-Crippa and P. W. Munro (1994) Emergence of global structure from local associations. In: J. D. Cowan, G. Tesauro, J. Alspector (eds.) *Advances in Neural Information Processing Systems 6.* San Mateo, CA: Morgan Kaufmann Publishers.

T. Ghiselli-Crippa and P. W. Munro (1994) Learning spatial structures from local associations. In: M. Mozer, P. Smolensky, D, Touretzky, J. Elman, A. Weigend (eds.) *Proceedings of the 1993 Connectionist Models Summer School.* Hillsdale NJ: Lawerence Erlbaum Associates Inc.

P. Munro (1993) Genetic search for optimal representations in neural networks. In: R. F. Albrecht, C. R. Reeves, N. C. Steele (eds.) *Artificial Neural Nets and Genetic Algorithms.* Proceedings of the International Conference in Innsbruck, Austria; Springer. pp 628-634.

S. Judd and P. Munro (1993) Nets with unreliable hidden nodes learn error-correcting codes. In: Giles, C. L., Hanson, S. J., Cowan, J. D., (eds.) *Advances in Neural Information Processing Systems 5.* San Mateo, CA: Morgan Kaufmann Publishers.

P. Munro (1992) Visualizations of 2-D Hidden Unit Space. 1992 International Joint Conference on Neural Networks. vIII. pp 468-473.

P. Munro (1992) Repeat until bored: a pattern selection strategy. In: Moody, J. E., Hanson, S. J., Lippman, R., (eds.) *Advances in Neural Information Processing Systems 4.* San Mateo, CA: Morgan Kaufmann Publishers.

P. Munro and M. Tabasko (1991) Translating locative prepositions. In: Touretsky, D.S., Lippman, R., (eds.) *Advances in Neural Informa:qtion Processing Systems 3.* San Mateo, CA: Morgan Kaufmann Publishers.

P. Munro and S. C. Hirtle (1990) The representation of structure in cognitive maps. Proceedings of the Fourth International Symposium on Spatial Data Handling. pp.732-741

P. Munro and S. C. Hirtle (1989) An interactive activation model for priming of geographical information.

Eleventh Ann. Conf. Cognitive Science Society Proceedings. pp. 773-780. Lawerence Erlbaum: Mahwah NJ.

C. Cosic and P.W. Munro (1988) Learning to represent and understand locative prepositional phrases. Tenth Ann. Conf. Cognitive Science Society Proceedings, pp. 257-262. Lawerence Erlbaum: Mahwah NJ.

P. W. Munro (1987) A dual back-propagation scheme for scalar reward learning. Ninth Ann. Conf. Cognitive Science Society Proceedings. pp. 165-176. Lawerence Erlbaum: Mahwah NJ.

P. W. Munro (1986) Self-supervised learning: a scheme for the discovery of "natural" categories by single units. Eighth Ann. Conf. Cognitive Science Society Proceedings. pp.765- 772. Lawerence Erlbaum: Mahwah NJ.

# Abstracts, Technical Reports & Reviews

P.W. Munro (1996) Review of *Mind*, Paul Thagard. *International Journal of Neural Systems*, 8:679-682.

P. W. Munro (1992) Review of *Neural Network Architectures: An Introduction*, Judith Dayhoff. *Neural Networks.* 5: 723-724.

P. Munro (1991) Genetic Search for Optimal Representations in Neural Networks. University of Pittsburgh SLIS Tech Report IS91007.

P. W. Munro (1989) Conjectures on representations in backpropagation networks. International Computer Science Institute TR-89-035, Berkeley CA.

P. W. Munro (1988) Review of *Vision, Brain, and Cooperative Computation*, M. Arbib and A. Hanson, eds. *Neural Networks.* 1:357-359.

P. W. Munro (1984) Plasticity in Visual Cortex: Critical Period or Critical State? *Soc. Neurosci. Abstr.* 10:468

P. W. Munro (1984) Local and Global Controls on Neural Plasticity: Theory and Experiment. *Behav. Proc.* 9:96-97

P. W. Munro, C. L. Scofield, and L. N Cooper (1982) A Theoretical Framework Encompassing Generalizing and Discriminating Units Applied to Feature Sensitive Neurons in Visual Cortex. *Soc. Neurosci. Abstr.* 8:296

# External Research Support

NSF Science of Learning Centers Program Subaward 10308146-SUB from TDLC/UCSD for "Connectionist model for mapping temporal structures", Sept 2009 – Aug 2012, $84088 (under NSF Prime Award SBE-0542013)

(Co-PI with Zvi Grossman) USC/NIH Transfusion Safety Study Subcontract for “Development of a Neural Network for the Analysis of Longitudinal Data”, July 1993-June 1995. $69361.

NSF Division of Information, Robotics, and Intelligent Systems Grant IRI-8910368 for "A Study of Generalization and Representations in Multilayered Connectionist Networks", July 1989 - December 1991. $59881.

(Co-PI with Edie Rasmussen) Pittsburgh Supercomputer Center Grant IRI900001P for “Genetic Search for Optimal Neural Networks”, January, 1990 - February, 1991. 5.0 Service Units.

Pittsburgh Supercomputer Center Grant PSCA 49 for “Image Compression by Encoding with Parallel Associative Neural Networks”, August, 1986 - August, 1987. 5.0 Service Units.

# Papers given (no proceedings)

**October, 1982** A Model for Environmentally Driven Development of Selective Neurons in Visual Cortex. Conference on the Neurobiology of Learning and Memory, University of California, Irvine.

**July, 1989** A comparison of two neural network schemes for navigation, Third Annual Workshop on Space Operations Automation and Robotics, Johnson Space Center.

# Invited Talks

**April 13, 1983** “Local and Global Constraints on Neural Plasticity: Theory and Experiment”, Tutorial Conference on Neural Modeling, Arizona State University, Tempe, AZ

**November, 1987** “Tools for Connectionist Modeling”, Society for Computers in Psychology, Seattle WA

**May, 1989** “Theory and Applications of Backpropagation”, Alcoa Research Laboratory, New Kensington PA

**July 13, 1989** “Memory and Learning in Neural Networks”, Houston Chapter of the ACM, Houston TX

**January 5, 1990** “Neuroevolution: Genetic Algorithms Meet Neural Networks”, Westinghouse Science and Technology Center, Churchill PA

**November 2, 1990** “NETLAND: Visualizations of 2-D Hidden Unit Space”, Indiana University, Bloomington IN

**October 19, 1991** “NETLAND: Visualizations of 2-D Hidden Unit Space”, Chukyo University, Nagoya JAPAN

**December 7, 1991** “Self-Supervised Learning of Concepts”, NIPS91 Workshop on Self-Organization and Unsupervised Learning in Vision, Vail CO

**March 19, 1992** “NETLAND: Visualizations of 2-D Hidden Unit Space”, Triangle Area Neural Network Society, Research Triangle Park, NC

**December 5, 1992** “NETLAND: Visualizations of 2-D Hidden Unit Space”, NIPS92 Workshop on Interpreting Neural Networks, Vail CO

**August 26, 1993** “Learning in Neural Networks”, NATO Advanced Study Institute on the Basics of Man-Machine Communication for the Design of Educational Systems. Eindhoven, The Netherlands

**March 23, 1994** “NETLAND: Visualizations of 2-D Hidden Unit Space”, Rensselaer Polytechnic Institute, Troy, NY

**December 2, 1994** “Medical Diagnosis by Committee”, NIPS ‘94 Workshop on Neural Networks in Medicine, Vail CO

**December 5, 1997** “Noisy Autoencoders”, NIPS ‘97 Workshop on Advances in Autoencoders, Breckenridge CO

**February 13, 1998** “Perspectives on Autoencoders”, Australian Conference on Neural Net­works, Brisbane, Australia

**October 29, 1999** “Neural Networks: How They Work and How to Use Them”, Rensselaer Polytechnic Institute, Troy, NY

**May 25, 2000** “Classification by a Committee of Neural Networks”, NIOSH, Morgantown WV

**October 17, 2000** “A Connectionist Model of Spatial Knowledge Acquisition”, Department of Computer Science, UCSD, La Jolla, CA

**July 31, 2001** “Convergence Properties of Weights under Multiplicative Spike-Timing Dependent Plasticity”. ANC Open House, Edinburgh, Scotland

**March 2, 2004** “The BCM Learning Rule: A Retrospective”, Monté Verita Workshop on Spike Timing Dependent Plasticity, Ascona, Switzerland

# Tutorials and short courses

**July 27, 1989** “Neural Networks: Theory and Application of Back Propagation”, 3 hour tutorial at the Third Annual Workshop on Automation and Robotics, NASA Johnson Space Center, Houston TX

**Feb. 11-15, 1991** “Neural Networks”, 5 day short course for IBM University Level Cur­riculum, Austin TX (with Dr. Tony Martinez)

**Oct. 21-25, 1991** “Neural Networks”, 5 day short course for IBM University Level Cur­riculum, Yamoto, JAPAN (with Dr. Tony Martinez)

**March 16-20, 1991** “Neural Networks”, 5 day short course for IBM University Level Cur­riculum, Research Triangle NC

**June 15-19, 1991** “Neural Networks”, 5 day short course for IBM University Level Cur­riculum, Toronto, Ont. CANADA

**October 24-29, 1993** “Neural Networks”, 5 day short course for IBM University Level Cur­riculum, Rochester MN

# Committees

## Editorial Boards

* *Noetica*, A Cognitive Science Forum
* *Connection Science* -- Special Issue on Committees of Neural Networks. Vol 8, 1996

## Conference Organization

* Program Committee Member NIPS 1994 Conference (Area chair for Cognitive Science)
* NIPS 1999 Workshop on “Spike Timing and Plasticity” (with Larry Abbott): <http://www.pitt.edu/~pwm/LTP_LTD_99>
* NIPS 2001 Workshop on “Activity Dependent Plasticity” (with Larry Abbott): <http://www.pitt.edu/~pwm/plasticity>
* CNS 2003 Workshop on “Activity Dependent Plasticity”
	+ <http://www.sis.pitt.edu/~pmunro/cnsplast>
* Program Committee Member ICCM 2004
	+ <http://simon.lrdc.pitt.edu/~iccm/>
* Cosyne 2006 Workshop on “Activity Dependent Plasticity “
	+ <http://www.gatsby.ucl.ac.uk/~pel/cosyne/schedules/plasticity>
* Cosyne 2008 Workshop on “Activity Dependent Plasticity “
	+ <http://cosyne.org/wiki/Cosyne_08_workshops>
* NIPS 2010 Workshop on “Activity Dependent Plasticity”
	+ <http://www.pitt.edu/~pwm/Plasticity2010/>
* CNS 2013 Workshop on “Activity Dependent Plasticity” (with Claudia Cloplath)
	+ <http://www.neurotheory.columbia.edu/~claudia/CNS2013>
* Cosyne 2016 Workshop on “Activity Dependent Plasticity” (with Rob Froemke)
	+ <http://www.cosyne.org/c/index.php?title=Workshops_02_07>
* Program Committee Member Cogsci 2016
* Program Committee Member Cogsci 2017
* Cosyne 2018 Workshop“Activity Dependent Plasticity” (with Julijana Gjorgjieva)
	+ http://www.cosyne.org/c/index.php?title=Workshops2018\_02\_08

## PhD Students Supervised

**December 1995** Bambang Parmanto, *Agitating Dissent: Methods for Improving Performance of a Neural Network Committee by Error Decorrelation.* University of Pittsburgh Department of Information Science.

**December 2000** Thea Ghiselli-Crippa, *Spatial and Temporal Factors in the Acquisition of Spatial Information,* University of Pittsburgh Department of Information Science and Telecommunications.

**November 2001** Gerardina Hernández, *Spike Timing Dependent Plasticity under Temporal Correlation Mechanisms*, University of Pittsburgh Intelligent Systems Program, Paul Munro and Jonathan Rubin, co-advisors.

**September 2003** Siripun Sanguansintukul, *A Neural Network Approach to Treatment Optimization*, University of Pittsburgh Department of Information Science and Telecommunications.

**October 2005** Lei Zheng, *Automated Feature Extraction and Content-Based Retrieval of Pathology Microscopic Images using K-Means Clustering and Code Run-Length Probability Distribution*, University of Pittsburgh Department of Information Science and Telecommunications.

**March 2010** Qiang Ye, *A Competitive Learning Neural Network Ensemble Weighted by Predicted Performance*, University of Pittsburgh Department of Information Science and Telecommunications.

**April 2010** Yefei Peng, *An Ontology Mapping Neural Network: an Approach to Learning and Inferring Correspondences among Ontologies*, University of Pittsburgh Department of Information Science and Telecommunications.

**July 2014** Lawrence Udeigwe, *Dynamical Systems of the BCM Rule:Emergent Properties and Application to Clustering*, University of Pittsburgh Department of Information Science and Telecommunications.

## Other PhD Dissertation Committees

**April 1989** Timothy van Gelder, *Distributed Representations,* University of Pittsburgh Department of Philosophy. John Haugeland, advisor.

**August 1989** Stephanie W. Haas, *Case Hierarchy Based Representations and Procedures for Domain Analysis and the Construction and Porting of Natural Language Interfaces.* University of Pittsburgh Department of Information Science. Douglas Metzler, advisor.

**October 1989** Krishnakumar Srinivasan, *A Connectionist Approach to Integrate Diagnostic and Predictive Aspects of Multiattribute Choice Models.* University of Pittsburgh Joseph M. Katz School of Business. Jerrold May and Rajeev Kohli, coadvisors.

**April 1993** Jing-Jye Yang, *Use of Genetic Algorithms for Query Improvement in Information Retrieval Based on a Vector Space Model.* University of Pittsburgh Department of Information Science. Robert Korfhage, advisor.

**June 1993** Terry Huston, *A Cognitive Model of Neural Network Design Characteristics.* University of Pittsburgh Joseph M. Katz School of Business. Jerrold May, advisor.

**May 1995** Paul E. Bakker, *On theImplementation of Quasi-regular Mappings by Feedforward Connectionist Networks*. University of Queensland. Janet Wiles, advisor.

**March 1996** David Dubin, *Structure in Document Browsing Spaces*. University of Pittsburgh Department of Information Science. Robert Korfhage, advisor

**March 1997** Murat Sönmez, *An Analysis of Fuzzy Integral Decision: A Novel Approach to EEG Source Localization*, University of Pittsburgh Department of Electrical Engineering, Ching-Chung Li, advisor.

**May 1997** Doug Landslittel, *A Simulation Study of Statistical Modeling with Neural Networks.* University of Pittsburgh Department of Biostatistics. Vincent Arena, advisor.

**May 1997** Anthony Harris, *A Computational Model of the Effects of Neurotrophic Factor on Ocular Dominance Column Development*. Intelligent Systems Program, Steven Small, advisor.

**January 1999** Adel Al-Rumaih, *A Spare Capacity Planning Methodology for Wide Survivable Networks*. University of Pittsburgh Department of Information Science and Telecommunications, David Tipper, advisor.

**March 1999** Boris Gutkin, *A Theory of Action Potential Generation in Cortical Neurons and its Implications for Neural Activity*, University of Pittsburgh Center for Neuroscience, Bard Ermentrout, advisor.

**May 1999** Sarah S. Y. Lam, *Improved Prediction and Validation using Resampled Neural Networks: Committee Networks and Hybrid Validation*, University of Pittsburgh Department of Industrial Engineering. Alice E. Smith, Advisor

**May 2001** Cynthia Martincic, *Mechanisms for Answering “Why Not” Questions in Rule- and Object-Based Systems,* Department of Information Science and Telecommunications, Douglas Metzler, advisor.

**June 2002** Venkateswarlu Kolluri, *Hierarchical Classification and Granular Regression using Taxonomically Structured Background Knowledge*, Department of Information Science and Telecommunications, Douglas Metzler and Bruce Buchanan co-advisors.

**June 2003** Ibrahim Hassan Abu El-Khair, *Effectiveness of Document Processing Techniques for Arabic Information Retrieval*, Department of Library and Information Sciences, Edie Rasmussen, advisor.

**March 2005** Scott William Bolland, *FAE: The Fluid Analogies Engine- A Dynamic, Hybrid Model of Perception and Mental Deliberation*, University of Queensland. Janet Wiles, advisor.

**April 2005** Denis Lemongew Nkweteyim, *On the Design of Hyperlink Recommender Systems*, University of Pittsburgh Department of Information Science. Stephen Hirtle, advisor.

**December 2007** Jijun Wang, *Human Control of Cooperating Robots*, University of Pittsburgh Graduate Information Science & Technology Program. Michael Lewis, advisor.

**December 2007** Jumpol Polvichai, *Modeling Team Performance for Coordination Configurations of Large Multi-Agent Teams*, University of Pittsburgh Graduate Information Science & Technology Program. Michael Lewis, advisor.

**December 2007** Yang Xu, *Token-Based Approach for Scalable Team Coordination*, University of Pittsburgh Graduate Information Science & Technology Program. Michael Lewis, advisor.

**August 2009** Xiaohui Kong, *Roles of Visual Working Memory, Global Perception and Eye-movement in Visual Cimplex Problem Solving*, University of Pittsburgh Intelligent Systems Program, Christian Schunn, advisor.

**August 2011** Duangduen Roongpiboonsopit, *Navigation Recommender: Real-time iGNSS QoS Prediction for Navigation Services*, University of Pittsburgh Graduate Information Science & Technology Program. Hassan Karimi, advisor.

**September 2011** Qi Li, *Searching for Entities: When Retrieval Meets Extraction*, University of Pittsburgh Graduate Information Science & Technology Program. Daqing He, advisor.

**March 2012** Ming Ren, *Advanced Map Matching Technologies and Techniques for Pedestrian-Wheelchair Navigation*, University of Pittsburgh Graduate Information Science & Technology Program. Hassan Karimi, advisor.

**July 2014** Monsak Socharoentum, *Multi-Modal Transportation and Multi-Criteria Walking (MMT-MCW) for Wayfinding and Navigation Services,* University of Pittsburgh Graduate Information Science & Technology Program. Hassan Karimi, advisor.

**March 2015** Pei-Ju Lee, *Efficient Information Integration System for Temporal and Spatial Data*, University of Pittsburgh Graduate Information Science & Technology Program. Vladimir Zadorozhny, advisor.

**December 2015** Carlos Sanchez, *An Analytics Based Architecture and Methodology for Collaborative Timetabling in Higher Education*, Graduate Information Science & Technology Program. Stephen Hirtle, advisor.

**October 2016** Yehudit Meir-Hasson, *Integration of different modalities to improve the spatio-temporal resolution*, Tel-Aviv University. Nathan Intrator, advisor.

## Masters Committees

**August 1990** Hideo Fujii, *Icon Transformation: Its Criteria and a Model.* University of Pittsburgh Department of Information Science. Robert Korfhage, advisor.

**June 1991** Donald T. Freeman, *Computer Recognition of Wave Location in Graphical Data by a Neural Network.* Intelligent Systems Program. Bruce Buchanan, advisor.

## University service

Chair, University Senate Committee on Plant Utilization and Planning 2007-2012

University Senate Committee on Plant Utilization and Planning 9/2004 - present

University Senate 9/2003 – present

University Planning and Budget Committee, 9/2007 - present

Faculty Assembly 9/2002 – present

ECAC subcommittee on PCs and Workstations: 9/1989 - 1992

Intelligent Systems Studies Program: Faculty (secondary appointment) 9/1987 - present

Center for Neuroscience (CNUP): Faculty (secondary appointment): 9/1994 - present

Classroom Management Team (CMT) 9/2008 - present

## School (SIS) service

Chair, Graduate Information Science and Technology (GIST) Program, August 2006 – June, 2012

Dean Search Committee 2001-2002

Committee on Networking and Technology Infrastructure (CONTI): 1989-1994, 1997-1999

Library Science Search Committee: 1988

IS Department Search committee: 1986 - 1988, 1996

IS PhD Committee: 1988 – present; Chairman, 1993-94, 1997-present

IS Graduate Curriculum Committee: Chairman, 1988-89

# Review of manuscripts

*Journals*: Neural Networks

Connection Science

Machine Learning

IEEE Transactions on Education

IEEE Transactions in Neural Networks

Psychological Assessment

*Conferences*: Cognitive Science Society, 1991 – 2005, 2008

Neural Information Processing Systems (NIPS), 1991 - 2000

*Books*: MIT Press

Lawerence Erlbaum Associates

# Professional Societies

Behavioral and Brain Sciences, Associate, 1988

International Neural Networks Society, 1986

Cognitive Science Society, 1985

New York Academy of Sciences, 1984

American Association for the Advancement of Science, 1984

Society for Neuroscience, 1984

Sigma Xi, 1982 Research Experience

**Sept 1992 –** **Present** ***Associate Professor (tenure awarded April, 1992)***

**Sept 1986 - Aug 1992 *Assistant Professor***

***Department of Information Science***

***University of Pittsburgh***

Tenure stream faculty member. Continuing my involvement with PDP interests in such areas as reward learning, concept formation, image compression, and the organization of cortical circuitry. Current specific interests include developing learning procedures that combine genetic algorithms with neural network learning approaches, modeling spatial cognition, and developing schemes for visualization.

**Fall Term 2000 (15 Weeks)** *Visiting Research Scientist, Department of Computer Science,* ***UCSD, San Diego CA***

Worked in collaboration with Garrison Cottrell on developing a network model of information acquisition. The “Age of Acquisition” (AoA) was recorded for each item and examined as a function of item frequency and inter-item similarity. [Sabbatical leave from University of Pittsburgh]

**Summer 1993 (10 Weeks)** ***Research Consultant*, *Pittsburgh Transplant Institute, University of Pittsburgh PA***

Led a team exploring neural network approaches to analysis of data from patients to diagnose hepatoma from a series of 8-10 blood measurements.

**Summer 1992 (10 Weeks)** ***Visiting Research Scientist*, *Siemens Corporate Research, Princeton NJ***

Continued work with Stephen Judd on training networks with nonreliable units to promote fault tolerance. Began studies on learning categories from positive examples only.

**Summer 1991 (10 Weeks) *Visiting Research Scientist*, *Siemens Corporate Research, Princeton NJ***

Continued work on pattern sequencing during training, and began collaborative work with Stephen Judd on training networks with nonreliable units to promote fault tolerance.

**Summer 1990 (10 Weeks) *Visiting Research Scientist*, *Siemens Corporate Research, Princeton NJ***

Worked independently in the Machine Learning Group on visualization of learning on color graphics workstations and on a hybrid genetic/neural learning procedure. Also, performed experiments on the effect of pattern sequencing during training.

**Summer 1989 (10 weeks) *Summer Research Fellow, NASA, Johnson Space Center, Houston Texas***

Worked with the artificial intelligence group of the Mission Support Directorate on applying neural networks to navigation and path-planning tasks.

**Summer 1988 (10 Weeks) *Visiting Research Scientist*, *International Computer Science Institute, Berkeley CA***

Investigated a back propagation approach to preposition understanding and machine translation of prepositions. Also, explored the influence of various parameters on the formation of internal representations during learning.

**January 1984 - April 1986 *Postdoctoral Fellow, Institute for Cognitive Science, UCSD, San Diego CA***

Member of the Parallel Distributed Processing (PDP) research group led by Dr. David Rumelhart. Projects: (1) category learning and concept formation, (2) principles underlying learning rate and critical periods, (3) an encoder network for performing image compression.

**June 1983 - December 1983 *Postdoctoral Fellow, Neurobiological Laboratory, University of Trondheim, Norway***

Conducted simulations and observed/assisted in neurophysiological experiments concerned with mapping receptive fields of neurons in cat visual cortex (Area 17) under the supervision of Dr. Paul Heggelund. Developed experimental tests for, and analyzed, Heggelund's model of simple and complex receptive fields.

**June 1980 - May 1983 *Graduate Research Assistant., Center for Neural Science, Brown University***

Worked on projects leading to and including my doctoral dissertation under the supervision of Dr. Leon Cooper. These projects involved the processes by which the cortex comes to extract features from the visual environment. The approach was to attempt to link principles of neural plasticity to mathematical properties of learning by massively parallel networks. Two months (July 1980 and August 1982) were spent visiting the laboratory of Dr. William Levy of the Department of Neurosurgery, University of Virginia Medical School to explore possible analytical approaches to his long-term potentiation (LTP) experiments in rat hippocampus. This technique is used to electrically induce change in the response properties of certain neuron populations and is therefore thought to be related to processes of learning and memory.

# Teaching Experience

**Sept 1992 - *Associate Professor (tenure awarded April, 1992)***

**Sept 1986 - Aug 1992 *Assistant Professor***

***Department of Information Science***

***University of Pittsburgh***

Courses: Introduction to Information Science (G)

Information Theory (G & UG)

Simulation Methodologies (UG)

Introduction to Parallel Distributed Processing (G)

Human Information Processing (G)

Introduction to Mathematics for Information Science (G)

**February 1979 - May 1980 *Teaching Assistant.***

***Center for Neural Science***

***Brown University***

Courses: Experimental Neurophysiology, Neuroscience I, II

**September 1977 - May 1978 *Teaching Assistant.***

***Department of Physics***

***Brown University***

Course: Experimental Physics I, II (Junior level course)