REFERENCES

[1]   R. P. Lippmann, "An Introduction to Computing with Neural Nets," *IEEE ASSP Magazine*, pp. 4-22, April 1987.

[2]   W. S. McCulloch and W. Pitt, "A Logical Calaulus of the Ideas Imminent in Nervous Activity," *Bulletin of Mathematical Biophysics*, 5, pp. 115-113, 1943.

[3]   D. O. Hebb, *The Organization of Behavior*, *A Neurosychological Theory*, John Wiley & Sons, New York, 1949.

[4]   F. Rosenblatt, *Principles of Neurodynamics*, New York, Spartan Books, 1959.

[5]   S. Grossberg, "Nonlinear Difference-differential Equations in Prediction and Learning theory," in *Proc. Natl. Acad. Sci. USA*, vol. 58, 1967, pp. 1329-1334.

[6]   J. J. Hopfield, "Neural Networks and Physical Systems with Emergent Collective Computational Abilities," in *Proc. Natl. Acad. Sci. USA*, vol. 79, April 1982, pp. 2554-2558.

[7]   J. J. Hopfield, "Neurons with Graded Response have Collective Computational Properties like those of Two-state Neurons," in *Proc. Natl. Acad. Sci. USA*, vol. 81, May, 1984, pp. 3088-3092.

[8]   D. E. Rumelhart and J. L. McClelland (Eds.), *Parallel Distributed Processing: Exploration in the Microstructure of Cognition, vol. 1*, Cambridge, MA: MIT Press, 1986.

[9]   J. L. McClelland and D. E. Rumelhart (Eds.), *Parallel Distributed Processing: Exploration in the Microstructure of Cognition, vol. 2*, Cambridge, MA: MIT Press, 1986.

[10]   T. J. Sejnowski and C. R. Rosenberg, "NETtalk: a Parallel Network that Learners to Read Aloud," *Johns Hopkins Univ. Technical Report* JHU/EECS-86/01, 1986.

[11]   J. A. Feldman and D. H. Ballard, "Connectionist Models and their Properties," *Cognitive Science*, vol. 6, pp. 205-254, 1982.

[12] S. Grossberg, *The Adaptive Brain I: Cognition, Learning, Reinforcement, and Rhythm*, Elsevier/North-Holland, Amsterdam, 1986.

[13] S. Grossberg, *The Adaptive Brain II: Vision, Speech, Language, and Motor Control*, Elsevier/North-Holland, Amsterdam, 1986.

[14] D. H. Ackeley, G. E. Hinton, and T. J. Sejnowski, "A learning Algorithm for Boltzmann Machines," *Cognitive Science* 9, pp. 147-169, 1985.

[15] B. Kosko, "Bidirectional Associative Memories," *IEEE Trans. Systems, Man, and Cybernetics*, vol. 18, no. 1, pp. 49-60, Jan./Feb. 1988.

[16] J. A. Freeman and D. M. Skapura, *Neural Networks -- Algorithms, Applications, and Programming Techniques*, Addison-Wesley Publishing Company, Inc. 1992.

[17] T. Khanna, *Foundations of Neural Networks*, Addison-Wesley Publishing Company, Inc. 1990.

[18] R. Hecht-Nielsen, *Neurocomputing*, Addison-Wesley Publishing Company, Inc. 1990.

[19] C. Mead, *Analog VLSI and Neural Systems*, Addison Wesley, 1989.

[20] B. E. Boser, E. Sackinger, J. Bromley, Y. leCun, and L. D. Jackel, "Hardware Requirements for Neural Network Pattern Classifiers," *IEEE Micro*, pp. 32-39, Feb. 1992.

[21] W.-C. Fang, B. J. Sheu, O. Chen, and J. Choi, "A VLSI Neural Processor for Image Data Compression using Self-organization Networks," *IEEE Trans. Neural Networks,* vol. 3, no. 3, pp. 506-517, May 1992.

[22] J.-C. Lee, B. J. Sheu, W.-C. Fang, and R. Chellappa, "VLSI Neuroprocessors for Video Motion Detection," *IEEE Trans. Neural Networks,* vol. 4, no. 2, pp. 178-191, Mar. 1993.

[23] T. J. Sejnowski and C. R. Rosenberg, "Parallel Networks that Learn to Pronounce English Text," *Complex Syst.*, vol. 1, pp. 145-168, 1987.

[24] K. J. Lang, A. H. Waibel and G. E. Hinton, "A Time-delay Neural Network Architecture for Isolated Word Recognition," *Neural Networks*, vol. 3, 1990.

[25] J.-C. Bor and C.-Y. Wu, "Analog Electronic Cochlea Design using Multi-clock Switched-capacitor Circuit," *IEEE Trans. on Neural Networks*, vol. 7, no. 1, pp. 155-166, Jan. 1996.

[26] M. Laiho, A. Paasio, A. Kananen, K. Halonen, "Cell and Network Level Design of a Mixed-mode CNN," in *Proc. IEEE Int. Symposium of Circuits and Systems*, *ISCAS*, 2002, Vol. 1, 2002, pp. 621 –624.

[27] A. Paasio, K. Halonen, "A new Cell Output Nonlinearity for Dense Cellular Nonlinear Network Integration**," *IEEE Trans. on, Circuits and Systems I: Fundamental Theory and Applications,* Vol. 48 Issue: 3, pp. 272 -280, March 2001.

[28] A. Paasio, M. Laiho, A. Kananen, K. Halonen, **"An Analog Array Processor Hardware Realization with Multiple new Features**," in *Proc. Int. Joint Conf. Neural Networks*, *IJCNN*, 2002, vol.2, 2002, pp. 1952 -1955.

[29] C. Koch J. Marroquin, and A. Yuille, "Analog 'Neuronal' Networks in Early Vision," in *Proc. Natl. Acad. Sci. USA*, vol. 83, April 1986, pp. 4263-4267.

[30] C. A. Mead and M. A. Mahowald, "A Silicon Model of Early Visual Processing," *Neural Networks*, vol. 1, 1988.

[31] J. G. Taylor, "A Silicon Model of Vertebrate Retinal Processing," *Neural Networks*, vol. 3, 1990.

[32] H.-C. Jiang and C.-Y. Wu, "A 2-D Velocity and Direction-selective Sensor with BJT-based Silicon Retina and Temporal Zero-crossing Detector," *IEEE J. Solid-State Circuits*, vol. 34, no. 2, pp.241-247, Feb. 1999.

[33] C.-Y. Wu and H.-C. Jiang, "An Improved BJT-based Silicon Retina with Tunable Image Smoothing Capability," *IEEE trans. VLSI Syst.*, vol. 7, no. 2, pp. 241-248, Jun. 1999.

[34] C.-H. Cheng, C.-Y. Wu, B. Sheu, L.-J. Lin, K.-H. Huang, H.-C. Jiang, W.-C. Yen, C.-W. Hsiao, "In the Blink of a Silicon Eye," *IEEE Circuits and Devices Mag.*, vol. 17 no. 3, pp. 20-32, May 2001.

[35] D. W. Tank and J. J. Hopfield, "Simple 'Neural' Optimization Networks: an A/D Converter Signal Decision Circuit, and a Linear Programming Circuit," *IEEE Trans. Circuits Syst.*, vol. 33, no. 5, pp. 533-541, May 1986.

[36]   J. Choi, S. H. Bang, and B. J. Sheu, "A Programmable Analog VLSI Neural Network Processor for Communication Receivers," *IEEE Trans. Neural Networks*, vol. 4, no. 3, pp. 484-495, May 1993.

[37]   U. Ruckert, "ULSI Architectures for Artificial Neural Networks," IEEE Micro, vol. 22, no. 3, pp.10 – 19, May-June 2002.

[38]   H. E. Rauch and T. Winarske, "Neural Networks for Routing Communication Traffic," *IEEE Contr, Syst. Mag.*, pp. 26-31, April 1988.

[39]   Y. Le Cun, et al, "Handwritten Digital Recognition: Applications of Neural Network Chips and Automatic Learning," *IEEE Communications Mag.*, pp. 41-46, Nov. 1989.

[40]   S. Nagata, M. Sekiguchi, and K. Assakawa, "Mobile Robot Control by a Structured Hierarchical Neural Network," *IEEE Contr. Syst. Mag.*, pp. 69-76, April 1990.

[41]   D. H. Nguyen and B. Widrow, "Neural Networks for Self-learning Control Systems," *IEEE Contr. Syst. Mag.*, pp. 18-23, April 1990.

[42]   L. G. Kraff and D. P. Campagna, "A Comparison between CMAC Neural Network Control and Two Traditional Adaptive Control Systems," *IEEE Contr. Syst. Mag.*, pp. 36-43, April 1990.

[43]   K. S. Narendra and K. Parthasarathy, "Identification and Control of Dynamical Systems using Neural Networks," *IEEE Contr. Syst. Mag.*, pp. 4-27, April 1990.

[44]   L. Bertucco, M. Coltelli, G. Nunnari, L. Occhipinti, "Cellular neural networks for real-time monitoring of volcanic activity," *Computers & Geosciences,* vol. 25, Issue 2, pp. 101-117, March, 1999

[45]   C. L. Giles, D. Chen, C. B. Miller, H. H. Chen, G. Z. Sun, and Y. C. Lee, "Second-order Recurrent Neural Networks for Grammatical Inference," in *Proc. Int. Joint Conf. Neural Networks*, vol. II, July 1991, pp. 273-281.

[46]   J. Hertz, A. Krogh, and R. G. Palmer, *Introduction to the Theory of Neural Computation*, Addison Wesley, 1991.

[47]   H. Ritter, T. Martinetz, and K. Schulten, *Neural Computation and Self-Organizing Maps*, Addison Wesley, 1992.

[48] P. D. Wasserman, *Neural Computing: Theory and Practice*, Van Nostrand Reinhold, New York, 1989.

[49] J. A. Anderson and E. Rosenfeld, eds., *Neurocomputing: Foundations of Research*, The MIT Press, Cambridge, MA, 1988.

[50] AFCEA International Press, *DARPA Neural Network Study*, 1988.

[51] T. Kohonen, *self-Organization and Associative Memory*, New York: Springer-Verlag, 1984.

[52] T. Kohonen, *Associative Memory: A System-Theoretical Approach*, Springer-Verlag, 1997.

[53] I. Kanter and H. Sompolinsky, "Associative Recall of Memory without Errors," *Phys. Rev. A*, vol. 35, pp. 380-392, 1987.

[54] R. P. Lippman, B. Gold, and M. L. Malpass, "A Comparison of Hamming and Hopfield Neural Nets for Pattern Classification," *MIT Lincoln Laboratory Technical Report*, TR-769.

[55] L. O. Chua and L. Yang, "Cellular Neural Networks: Theory," *IEEE Trans. Circuits Syst.*, vol. 35, pp.1257-1272, Oct. 1988.

[56] L. O. Chua and L. Yang, "Cellular Neural Networks: Applications," *IEEE Trans. Circuits Syst.*, vol. 35, no. 10, pp.1273-1290, Oct. 1988.

[57] T. Roska and J. Vandewalle, *Cellular Neural Networks*, John Wiley and Sons, New York, 1993.

[58] L. O. Chua, *CNN: A Paradigm for Complexity*, World Scientific series on Nonlinear Science, vol. 31, 1998.

[59] D. Liu, and A.N. Michel, "Cellular Neural Networks for Associative Memories," *IEEE trans. on Circuits and Systems II: Analog and Digital Signal processing*, vol. 40, no. 2, pp.119-121, 1993.

[60] A. Lukianiuk, "Capacity of Cellular Neural Networks as Associative Memories," in *Proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA-96*, 1996, pp.37-40.

[61] P. Szolgay, I. Szatmari, and K. Laszlo, "A Fast Fixed Point Learning Method to Implement Associative Memory on CNNs," *IEEE Trans. on Circuits and Systems I: Fundamental Theory and Applications*, vol. 44, pp. 362-366, Apr. 1997.

[62] G. Grassi and E. Di Sciascio, "Learning Algorithm for Pattern Classification using Cellular Neural Network," *Electronics letters*, vol. 36, no. 23, pp.1941-1943, Nov. 2000.

[63] R.Perfetti and G. Costantini, "Multiplierless Digital Learning Algorithm for Cellular Neural Networks," *IEEE Trans. on Circuits and Systems I: Fundamental Theory and Applications*, vol. 48, no. 5, pp. 630-635, May 2001.

[64] B.-J. Sheu and J. Choi, *Neural Information Processing and VLSI*, Kluwer Academic Publishers, 1995.

[65] T. Roska, P. Varaiya and A. B. Kurzhanski (ed), "Analog Events and a Dual Computing Structure using Analog and Digital Circuits and Operators," *Discrete Event Systems: Models and Applications*, pp. 225-238, Springer Verlag, New York, 1988.

[66] Andrea Zanela, Sergio Taraglio, "Sensing the third Dimension in Stereo Vision Systems: a Cellular Neural Networks Approach," *Engineering Applications of Artificial Intelligence,* vol. 11, Issue 2, pp. 203-213, April, 1998.

[67] T. Roska and L. O. Chua, "Cellular Neural Networks with Nonlinear and Delay-type Template Elements and Non-uniform Grids," *Int. Jour. Circuit Theory and Applications*, vol. 20, pp. 469-481, May 1993.

[68] T. Roska and L. O. Chua, "Cellular Neural Networks with Nonlinear and Delay-type Template Elements," in *Proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA*, Dec. 1990, pp. 12-25.

[69] F. Werblin, T. Roska, and L. O. Chua, "The Analogic Cellular Neural Network as a Bionic Eye," *Int. Jour. Circuit Theory and Applications*, vol. 23, pp. 541-569, 1994.

[70]   L. Orzo, Z. Vidnyanszky, J. Hamori, and T. Roska, "CNN Model of the Feature-linked Synchronized Activities in the Visual Thalamo-cortical System," in *Proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA*, June 1996, pp. 291-296.

[71]   L. O. Chua, M. Hasler, G. S. Moschytz, and J. Neirynck, "Autonomous Cellular Neural Networks: a Nnified Paradigm for Pattern Formation and Active Wave Propagation," *IEEE Trans. Circuits Syst. I*, vol. 42, pp. 559-577, Mar. 1995.

[72]   T. Roska, "Analogic CNN Computing: Architectural, Implementation, and Algorithmic Advances-a Review," in *proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA*, April 1998, pp. 3-10.

[73]   L. Ravezzi, G. F. Dalla Betta, and G. Setti, "A New Current Mode Programmable Cellular Neural Network," in *proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA*, April 1998, pp. 253-258.

[74]   D. Lim and G. S. Moschytz, "A Programmable gm-C CNN Implementation," in *proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA*, April 1998, pp. 294-299.

[75]   D. Lim and G. S. Moschytz, "A Modular gm-C Programmable CNN Implementation," in *proc. IEEE Int. Symposium of Circuits and Systems*, *ISCAS*, vol. 3, 1998, pp. 139-142.

[76]   Chun-Li Yin, Jin-Liang Wan, Lin Hai, Wai-Kai Chen, "The Cloning Template Design of a Cellular Neural Network," *Journal of The Franklin Institute,* Vol.336, Issue: 6, pp. 903-909, August, 1999.

[77]   C.-Y. Wu and C.-H. Cheng, "A Cellular Neural Network with Ratio Memory for Learning and Recognition," in *Proc. 11th VLSI Design/CAD Symposium*, Nov. 2000, pp. 377-382.

[78]   A. Pasio and K. Halonen, "Cellular Nonlinear Network Implementation for Nonlinear B-Template," in *Proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA*, May 2000, pp. 437 –442.

[79]   Slavova, Angela, "Applications of some Mathematical Methods in the Analysis of Cellular Neural Networks," *Journal of Computational and Applied Mathematics*, Vol. 114, Issue 2, pp. 387-404, Feb. 1, 2000.

[80]   M. Zhenjiang and Y. Baozong, "A New Analytical Method for AM Neural Networks and its Application to Pattern Recognition," in *Proc. IEEE Int. Conf. on Neural Networks*, 1993, pp. 1570-1575.

[81]   M. E. Savran and O. Morgul, "On the Design of Dynamic Associative Neural Memories," *IEEE Trans. Neural Networks*, vol. 5, no. 3, pp. 489-492, May 1994.

[82]   A. Lukianiuk, "Capacity of Cellular Neural Networks as Associative Memories," in *proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA*, June 1996, pp. 37 -40.

[83]   J.-H. Wang, "Principal Interconnections in Higher Order Hebbian-type Associative Memories," *IEEE Trans. Knowledge Data Eng.*, vol. 10, no. 2, pp. 342-345, March/April 1998.

[84]   C. Orovas and J. Austin, "A Cellular System for Pattern Recognition using Associative Neural Networks," in *Proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA*, 1998, pp. 143-148.

[85]   Yu. I. Balkarey, A. S. Cohen, M. I. Elinson, M. G. Evtikhov, Yu. N. Orlov, and P. I. Perov, "Associative Memory without Global Inter-neuron Connect," in *Proc. IEEE Int. Joint Conf. on Neural Networks, IJCNN*, vol. 2, 1998, pp. 938-942.

[86]   A. A. Frolov and D. Husek, "Recall Time in Sparsely Encoded Hopfield-like Associative Memory," in *Proc. IEEE Int. Joint Conf. on Neural Networks, IJCNN*, vol. 2, 1998, pp. 520-524.

[87]   X. Zhong, G. Xinbo and X. Weixin, "A Fuzzy Associative Memory Pattern Classifier," in *Proc. ICSP*, 1998, pp. 1217-1220.

[88]   Osana, Y.a and Hagiwara, M., "Successive Learning in Hetero-associative Memories using Chaotic Neural Networks," in *Proc. IEEE Int. Neural Networks for Computational Intelligence,* Vol. 2, May 1998, pp. 1107 –1112.

[89] A. Heittmann and U. Rückert, "Mixed Mode VLSI Implementation of a Neural Associative Memory," in *Proc. Int. Conf. on Microelectronics for Neural, Fuzzy and Bio-Inspired Systems*, 1999, pp. 299-306.

[90] E. Chicca, D. Badoni, V. Dante, M. D'Andreagiovanni, G. Salina, L. Carota, S. Fusi, P. Del Giudice, "A VLSI Recurrent Network of Integrate-and-fire Neurons Connected by Plastic Synapses with Long-term Memory," *IEEE Trans. on, Neural Networks,* vol. 14, no. 5, pp.1297 – 1307, Sept. 2003.

[91] I. Salih, S. H. Smith, and D. Liu, "Design of Bidirectional Associative Memories Based on the Perceptron Training Technique," in *Proc. IEEE Int. Symposium on Circuits and Systems*, *ISCAS*, vol. 5, 1999, pp. 355-358.

[92] M. Kawamura, M. Okada, and Y. Herai, "Dynamics of Selective Recall in an Associative Memory Model with One-to-many Associations," *IEEE Trans. Neural Networks*, vol. 10, no. 3, pp. 704-713, May 1999.

[93] Y. Fukuhara and Y. Takefuji, "Dynamic Associative Memory using Chaotic Neural Networks," in *Proc. Int. Conf. on Intelligent Processing and Manufacturing of Materials*, *IPMM*, vol. 2, pp. 743-748, 1999.

[94] R. Perfetti, "Dual-mode Space-varying Self-designing Cellular Neural Networks for Associative Memory," *IEEE Trans. Circuits Syst. I*, vol. 46, no. 10, pp. 1281-1285, Oct. 1999.

[95] K. Li, L. Yang, J. Liu, and Z. He, "Associative Memory of Gray-scale Images Based on Chaotic Neural Networks," in *TENCON*, pp. 1375-1378, 1999.

[96] Hongchi Shi; Yunxin Zhao; Xinhua Zhuang, "A General Model for Bidirectional Associative Memories**,"** *IEEE Trans. on Systems, Man and Cybernetics, Part B,* vol. 28, no. 4, pp. 511 –519, Aug 1998.

[97] Yingquan Wu; Pados, D.A., "A Feed-forward Bidirectional Associative Memory**,"** *IEEE Trans. on Neural Networks,* vol. 11 no. 4, pp. 859 –866, Jul 2000.

[98] Lipo Wang, "Heteroassociations of Spatio-temporal Sequences with the Bidirectional Associative Memory**,"** *IEEE Trans. on Neural Networks,* vol. 11 no. 6, pp.1503 –1505, Nov. 2000.

[99]   B. Lenze, "Improving Leung's Bidirectional Learning Rule for Associative Memories**,"** *IEEE Trans. on Neural Networks,* vol. 12 no. 5, pp. 1222 –1226. Sep. 2001.

[100] Chua-Chin Wang, Yih-Long Tseng, Ying-Pei Chen, Chenn-Jung Huang, "A Fast Inner Product Processor Implementation for Multi-valued Exponential Bi-directional Associative Memories*;* in *Proc. IEEE Int. Symposium Circuits and Systems*, *ISCAS*, vol. 2, 2002, pp. 113 –116.

[101] M.K. Muezzinoglu, C. J.M. Guzelis, Zurada, "A New Design Method for the Complex-valued Multistate Hopfield Associative Memory," *IEEE Trans. on Neural Networks,* vol. 14, no. 4, pp.891 – 899, July 2003.

[102] T. Kamto, M. Morisue, "A Synthesis Procedure for Associative Memories using Cellular Neural Networks with Space-invariant Cloning Template Library," in *Proc. of the International Joint Conference on Neural Networks*, vol. 2*,* July, 2003, pp. 885-890.

[103] M.K. Muezzinoglu, C. Guzelis, "A Boolean Hebb Rule for Binary Associative Memory Design," *IEEE Trans. on Neural Networks,* vol. 15, no. 1, pp.195 – 202, Jan. 2004.

[104] A. Schultz, C. Rekeczky, I. Szatmari, T. Roska, and L. O. Chua, "Spatio-temporal CNN Algorithm for Object Segmentation and Object Recognition," in *Proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA*, April 1998, pp. 347-352.

[105] Z. Lu, and D. Liu, "Design of Cellular Neural Networks with Space-invariant Cloning Template," in *Proc. IEEE Int. Symposium Circuits and Systems*, *ISCAS*, vol. 3, 1998, pp. 215-218.

[106] G. Grassi, D. Cafagna, "Dynamic Properties of a Class of Cellular Neural Networks: Model, Stability Analysis and Design Method," in *Proc. of the International Joint Conference on Neural Networks*, vol. 1*,* July, 2003, pp. 61- 65.

[107] M. Brucoli, L. Carnimeo, and G. Grassi, "An Approach to the Design of Space-varying Cellular Neural Networks for Associative Memories," in *Proc. the 37th Midwest Symposium on Circuits and Syst.*, vol. 1, 1994, pp. 549-552.

[108] H. Kawabata, M. Nanba, and Z. Zhang, "On the Associative Memories in Cellular Neural Networks," in *Proc. IEEE Int. Conference on Systems, Man, and Cybernetics, Computational Cybernetics and Simulation*, vol. 1, 1997, pp. 929 - 933.

[109] P. Szolgay, I. Szatmari, and K. Laszlo, "A Fast Fixed Point Learning Method to Implement Associative Memory on CNNs," *IEEE Trans. Circuits and Syst. I*, vol. 44, no. 4, pp. 362-366, Apr. 1997.

[110] R. Perfetti and G. Costantini, "Multiplierless Digital Learning Algorithm for Cellular Neural Networks," *IEEE Trans. on Circuits Syst. I*, vol. 48, no. 5, pp. 630-635, May 2001.

[111] Pudov and Sergey," Learning of Cellular Neural Networks," *Future Generation Computer Systems,* vol. 17, no. 6, pp. 689-697, April, 2001.

[112] M. Wakamura and Y. Maeda, "FPGA Implementation of Bidirectional Associative Memory via Simultaneous Perturbation Rule," in *Proc. the 41st SICE Annual Conference, SICE 2002*, vol. 3, 5-7, Aug. 2002, pp.1631-1632.

[113] G. Costantini, D. R. Casali, Perfetti, "Neural Associative Memory Storing Gray-coded Gray-scale Images," *IEEE Trans. on Neural Networks*, vol. 14, no. 3, pp.703 – 707, May 2003.

[114] H. K. Kwan, "Three-layer Bidirectional Asymmetrical Associative Memory," in *proc. of IEEE Int. Symposium on Circuits and Systems, ISCAS-2003*, vol. 3, May 2003, pp. III 482 - 485.

[115] M.K. Muezzinoglu, C. Guzelis, J.M. Zurada, "A New Design Method for Complex-valued Multistate Hopfield Associative Memory," in *proc. of the International Joint Conference on Neural Networks*, vol. 1, July, 2003, pp. 45- 50.

[116] Ming-Jung Scow and V. K. Asari, "High Performance Associative Memory with Distance Based Training Algorithm for Character Recognition," in *proc. of the International Joint Conference on Neural Networks*, vol. 2, July, 2003, pp. 1185 -1188.

[117] Mu Xiaoyan, M. Artiklar, M.H. Hassoun, P. Watta, "An RCE-based Associative Memory with Application to Human Face Recognition," in *proc. of the International Joint Conference on Neural Networks*, vol. 4, July 2003, pp.2552- 2557.

[118] A. paasio, K. Halonen, and V. porra, "CMOS Implementation of Associative Memory using Cellular Neural Network Having Adjustable Template Coefficients," in *proc. IEEE Int. Symposium on Circuits and Systems, ISCAS*, vol. 6, 1994, pp. 487-490.

[119] B. Widrow, M. C. Jovitz, G. T. Jacobi, and G. Goldstein, "Generalization and Information Storage in Networks of Adaline 'Neuron'," *Self-organizing Systems*, Spartan Books, Washington, D.C., pp. 435-461, 1962.

[120] W. C. Ridgway III, *An Adaptive Logic System with Generalizing Properties*, PhD Thesis, Stanford Electronics Labs. Rep. 1556-1, Stanford University, Stanford, Ca., Apr. 1962.

[121] B. Widrow and M. A. Lehr, "30 Years of Adaptive Neural Networks: Perceptron, Madaline, and Backpropagation," in *Proc. IEEE*, vol. 78, 1990, pp. 1415-1441.

[122] D. E. Rumelhart, G. E. Hinton, R. J. Williams, D. E. Rumelhart and J. L. McClelland, "Learning Internal Representations by Error Propagation," *Parallel Distributed Processing: Explorations in the Microstructure of Cognition*, pp. 318-362, MIT Press, Cambridge, MA, *1986*.

[123] D. Macq, M. Verleysen, P. Jespers, and J. Legat, "Analog Implementation of a Kohonen Map with On-chip Learning," *IEEE Trans. Neural Networks*, vol. 4, no. 3, pp. 456-461, May 1993.

[124] D. J. Willshaw and C. von der Malsburg, "How Patterned Neural Connections can be Set up by Self-organization," in *Proc. Royal Soc.*, vol. B 194, 1976, pp. 431-445, London.

[125] C. von der Malsburg, "Pattern Recognition by Labeled Graph Matching," *Neural Network*, vol. 1, pp. 141-148, 1988.

[126] B. S. Manjunath, R. Chellappa, and C. von der Malsburg, "A Feature Based Approach to Face Recognition," in *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, *CVPR*, June 1992, pp. 373-378.

[127] K. Fukushima and S. Miyaka, "Neocpgnitron: A self-organizing Neural Network Model for a Mechanism of Pattern Recognition Unaffected by Shift in Position," *Biol. Cybern.*, vol. 36, pp. 193-202, 1980.

[128] S. Grossberg, "On Learning, Information, Lateral Inhibition, and Transmitters," *Mathematical Biosciences* 4, pp. 255-310, 1969.

[129] S. Grossberg, "Some Networks that can Learn, Remember, and Reproduce any Number of Complicated Space-time Patterns, II," *Studies in Applied Mathematics*, vol. XLIX, no. 2, pp. 135-166, June 1970.

[130] S. Grossberg, "Pavlovian Pattern Learning by Nonlinear Neural Networks," in *Proc. Nat. Acad. Sci. USA*, vol. 68, no. 4, April 1971, pp. 828-831.

[131] S. Grossberg, "Contour Enhancement, Short Term Memory, and Constancies in Reverberating Neural Networks," *Studies in Applied Mathematics*, vol. LII, no. 3, pp. 213-253, Sept. 1973.

[132] S. Grossberg, "Adaptive Pattern Classification and Universal Recoding: I. Parallel Development and Coding of Neural Feature Detectors," *Biological Cybernetics*, 23, pp. 121-134, 1976.

[133] S. Grossberg, *Studies of Mind and Brain: Neural Principles of Learning, Perception, Development, Cognition, and Motor Control,* D. Reidel Publishing Co., 1982.

[134] S. Grossberg, "Some Nonlinear Networks Capable of Learning a Spatial Pattern of Arbitrary Complexity," in *Proc. Natl. Acad. Sci. USA,* vol. 59, 1968, pp. 368-372.

[135] S. Grossberg, "Some Networks that can Learn, Remember, and Reproduce any Number of Complicated Space-time Patterns, I," *J. Mathematics and Mechanics*, vol. 19, no. 1, pp. 53-91, 1969.

[136] A. Krogh, J. A. Hertz R. Eckmiller, G. Hartmann and G. Hauske, "Hebbian Learning of Principal Components, " *Parallel Processing in Neural Systems and Computers*, Elsevier, Amsterdam, pp. 183-186.

[137] T. D. Sanger and D. S. Touretzky, "An optimality principle for unsupervised learning," in *Advances in Neural Information Processing Systems*, vol. I, San Mateo, CA: Morgan Kaufmann, 1989, pp. 11-19.

[138] J. M. Zurada, *Introduction to Artificial Neural Systems*, West Publishing Company, St. Paul, MN, 1992.

[139] T. Yang, "Continuous-time and Discrete-time Cellular Neural Networks," *Advances in Image and Electron Physics*, vol. 114, 2000.

[140] L. O. Chua and T. Roska, Cellular Neural Networks − Foundations and Primer, *Lecture notes/EE205, University of California*, Berkeley, 2000.

[141] Chunguang Li, Hongbing Xu, Xiaofeng Liao, Juebang Yu, "Tabu Search for CNN Template Learning," *Neurocomputing*, vol. 51, pp. 475-479, April, 2003

[142] H. Harrer, P. L. Venetianer, J. A. Nossek, T. Roska, et. al. "Some Examples of Preprocessing Analog Images with Discrete-time Cellular Neural Networks," in *Proc. Third IEEE Int. Workshop on Cellular Neural Networks and their Applications*, CNNA, 1994, pp. 201-206.

[143] H. Harrer, "Multiple Layer Discrete Cellular Neural Networks using Time-variant Templates," *IEEE Trans. Circuits Syst. II*, vol. 40, pp. 191-199, Mar. 1993.

[144] H. Mizutani, "A New Learning Method for Multilayered Cellular Neural Networks," in *Proc. IEEE Int. Workshop on Cellular Networks and their Applications*, *CNNA*, Dec. 1994, pp. 195-200.

[145] S. Majorana and L. O. Chua, "A Unified Framework for Multilayer High Order CNN," *Int. Jour. Circuit Theory and Applications*, vol. 26, no. 6, pp. 567-592, 1998.

[146] P. P. Civalleri and M. Gilli, "Some Dynamic Phenomena in Delayed Cellular Neural Networks," *Int. Jour. Circuit Theory and Applications*, vol. 22, pp. 469-481, Feb. 1993.

[147] M. Gilli, "Stability of Cellular Neural Networks and Delayed Cellular Neural Networks with Nonpositive Templates and Nonmonotonic Output Function," *IEEE Trans. Circuits Syst. I*, vol. 41, pp. 518-528, Aug. 1994.

[148] M. Finocchiaro and R. Perfetti, "Relation between Template Spectrum and Stability of Cellular Neural Networks with Delay," *Electronics Letters*, vol.31, pp. 2024-2026, 1995.

[149] Xiaofeng Liao, Zhongfu Wu, and Juebang Yu, "Stability Analyses of Cellular Neural Networks with Continuous Time Delay," *Journal of Computational and Applied Mathematics,* Vol. 143, Issue: 1, pp. 29-47, June 1, 2002

[150] Feng Chunhua, R. Plamondon, "Stability Analysis of Bidirectional Associative Memory Networks with Time Delays," *IEEE Trans. on Neural Networks,* vol. 14, no. 6, pp.1560-1565, Nov. 2003.

[151] V. Singh, "Robust Stability of Cellular Neural Networks with Delay: Linear Matrix Inequality Approach," in *Proc. IEE Control Theory and Applications,* vol. 151, no. 1, Jan. 2004, pp. 125-129.

[152] V. Singh, "A Generalized LMI-Based Approach to the Global Asymptotic Stability of Delayed Cellular Neural Networks," *IEEE Trans. on Neural Networks,* vol. 15, no. 1, Jan. pp. 223-225, 2004.

[153] L. O. Chua and L. Goras, "Turing Patterns in Cellular Neural Networks," *Int. Jour. Electronics*, vol. 79, pp. 719-736, June 1995.

[154] S. Jankowski, A. Londei, C. Mazur, and A. Lozowski, "Synchronization Phenomena in 2D Chaotic CNN," in *Proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, Dec. 1994, pp. 339-344.

[155] M. J. Ogorzalek, Z. Galias, W. Dabrowski, and A. Dabrowski, "Spatio-temporal Cooperative Phenomena in CNN Arrays Composed of Chaotic Circuits-simulation Experiments," *Int. Jour. Circuit Theory and Applications*, vol. 24, pp. 261-268, Mar. 1996

[156] V. Perez-Munuauri, A. P. Munuauri, M. Gomez-Gesteira, and V. Perez-Villar, "Nonlinear Waves, Patterns and Spatio-temporal Choas in Cellular Neural Networks," *Phil. Trans. Royal Soc. Series A* (Physical Sciences and Engineering), vol. 353, pp.101-113, 1995.

[157] T. Roska and L. O. Chua, "The CNN Universal Machine: an Analogic Array Computer," *IEEE Trans. Circuits Syst. II*, vol. 40, pp. 163-173, Mar. 1993.

[158] S. Espejo, R. Carmona, R. Domínguez-Castro, and A. Rodríguez-Vázquez, "A CNN Universal Chip in CMOS Technology," *Int. J. Circuit Theory and Applications*, vol. 24, pp. 93-109, Mar. 1996**.**

[159] R. Domínguez-Castro, S. Espejo, A. Rodríguez-Vázquez, R. A. Carmona, P. Foldesy, Á. Zarándy, P. Szolgay, T. Sziranyi and T. Roska, "A 0.8μm CMOS Two-dimensional Programmable Mixed-signal Focal-plane Array Processor with On-chip Binary Imaging and Instructions Storage," *IEEE J. Solid-State Circuits*, vol. 32, no. 7, pp. 1013-1026, July 1997.

[160] L. Kék and Á. Zarándy, "Implementation of Large-neighborhood Non-linear Templates on the CNN Universal Machine," *Int. Jour. of Circuit Theory and Applications*, vol. 26, pp. 551-566, 1998.

[161] M. Porrmann, U. Witkowski, H. Kalte, U. Ruckert, "Implementation of Artificial Neural Networks on a Reconfigurable Hardware Accelerator," in *proc. of 10th Euromicro Workshop on Parallel, Distributed and Network-based*, 9-11, Jan. 2002, pp.243 – 250.

[162] K. R. Crounse and L. O. Chua, "The CNN Universal Machine is as Universal as a Turing Machine," *IEEE Trans. Circuits Syst. I*, vol. 43, pp. 191-199, April 1996.

[163] T. Yang, L. B. Yang, C. W. Wu, and L. O. Chua, "Fuzzy Cellular Neural Networks: Theories," in *Proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications, CNNA*, June 1996, pp. 181-186.

[164] T. Yang, L. B. Yang, C. W. Wu, and L. O. Chua, "Fuzzy Cellular Neural Networks: Applications," in *Proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, *CNNA*, June 1996, pp. 225-230.

[165] C.-Y. Wu and J.-F. Lan, "CMOS Current-mode Neural Associative Memory Design with On-chip Learning," *IEEE Trans. Neural Networks*, vol. 7, no. 1, pp. 167-181, 1996.

[166] J.-F. Lan and C.-Y. Wu, "CMOS Current-mode Outstar Neural Networks with Long-period Analog Ratio Memory," in *Proc. IEEE Int. Symposium on Circuits and Systems*, *ISCAS*, vol. 3, 1995, pp. 1676-1679.

[167] J.-F. Lan and C.-Y. Wu, "Analog CMOS Current-mode Implementation of the Feedforward Neural Network with On-chip Learning and Storage," in *Proc. IEEE Int. Conference on Neural Networks*, 1995, pp. 645-650.

[168] C.-Y. Wu and C.-H. Cheng, "The Design of CMOS Modified Hopfield Neural Network for Pattern Recognition," in *Proc. Int. Symposium on Multimedia Information*, 1997, pp. 585-590.

[169] C.-Y. Wu and C.-H. Cheng, "The Design of Cellular Neural Network with Ratio Memory for Pattern Learning and Recognition," in *Proc. 6th IEEE International Workshop on Cellular Neural Network and Their Applications, CNNA 2000*, May 2000, pp. 301-307.

[170] C.-Y. Wu and J.-L. Lai, "The Improvement of Pattern Learning and Recognition Capability in Ratio-Memory Cellular Neural Networks with Non-discrete-type Hebbian Learning Algorithm," in *Proc. IEEE Int. Symposium on Circuits and Systems, ISCAS-2002*, vol. I, May 2002, pp.629-632.

[171] C.-Y. Wu and C.-H. Cheng, "A Learnable Cellular Neural Network Structure with Ratio Memory for Image Processing," *IEEE Trans Circuits Syst. I*, vol. 49, no. 12, pp.1713-1723, Dec. 2002.

[172] C.-H. Cheng and C.-Y. Wu, "The Design of Ratio-Memory Cellular Neural Network (RMCNN) with Self-feedback Template Weight for Pattern Learning and Recognition," in *Proc. 7th IEEE International Workshop on Cellular Neural Network and Their Applications, CNNA* , July 2002, pp. 609-615.

[173] Ming-Jung Seow, and V.K. Asari, "Associative Memory using Ratio Rule for Multi-valued Pattern Association," in *proc. the Int. Joint Conference on Neural Networks*, vol. 4, 20 - 24, July 2003, pp.2518 – 2522.

[174] J-L Lai and C-Y Wu, "Architectural Design and Analysis of Learnable Self-Feedback Ratio-Memory Cellular Nonlinear Network (SRMCNN) for Nanoelectronic Systems," accepted by *IEEE Trans. on Vary Large Scale Integration systems*, 2003.

[175] J-L Lai and C-Y Wu, "A New Learnable Self-Feedback Ratio-Memory Cellular Nonlinear Network (SRMCNN) with B Templates for Associative Memory Applications," in *Proc. Int. Symposium on Nanoelectronic Circuits and Giga-scale Systems*, *ISNCGS*, Feb. 2004, pp. 124-127.

[176] C. Y. Wu and C. F. Chiu, "A New Structure for the Silicon Retina," *IEDM Tech. Dig.*, pp. 439-442, Dec. 1992.

[177] C. Y. Wu and C. F. Chiu, "A Rew Structure for the 2-Dimensional Silicon Retina," *IEEE J. Solid-State Circuits*, vol. SC-30, pp. 890-897, Aug. 1995.

[178] C. Y. Wu and W. C. Yen, "A New Compact Neuron-bipolar Junction Transistor (nBJT) Cellular Neural Network (CNN) Structure with Programmable Large Neighborhood Symmetric Templates for Image Processing," *IEEE Trans. Circuits Syst. I*, vol. 48, no. 1, pp. 12-27. 2001

[179] J. M. Cruz and L. O. Chua, "A 16x16 Cellular Neural Network Universal Chip: The First Complete Single-chip Dynamic Computer Array with Distributed Memory and with Gray-scale Input-output," *Analog Integrated Circuits and Signal Processing*, vol. 15, pp. 3-14, 1998.

[180] A. Passio, A. Dawidziuk, K. Halonen, and V. Porra, "Minimum Size 0.5 μm CMOS Programmable 48x48 CNN Test Chip," in *Proc. European Conf. Circuit Theory and Design*, Sept. 1997, pp. 154-156.

[181] G. Liñán, S. Espejo, R. Domínguez-Castro, and A. Rodríguez-VázqueZ, "The CNNUC3: An Analog I/O 64´64 CNN Universal Machine Chip Prototype with 7-bit Analog Accuracy," in *Proc. IEEE Int. Workshop on Cellular Neural Networks and their Applications*, May 2000, pp. 201-206.

[182] M. Laiho, A. Paasio, A. Kananen, K.A.I. Halonen, "A Mixed-Mode Polynomial Cellular Array Processor Hardware Realization," *IEEE Trans. Circuits and Systems I: Regular Papers*, vol. 51, no. 2, pp.286- 297, Feb. 2004.

簡　　歷

姓　　名 ：　賴 瑞 麟

性　　別 ：　男

出生日期 ：　民國44年04月25日

出 生 地 ：　臺中市

住　　址 ：　台中市南區建國南路一段162號6樓

學　　歷 ：

私立聯合工業專科學校電子工程科畢業　　(63年9月–65年6月)

國立台灣工業技術學院電子工程系畢業　　(71年9月–73年6月)

國立交通大學控制研究所碩士班　　(76年9月–79年6月)

國立交通大學電子研究所博士班　　(87年9月入學)

經　　歷 ：

私立聯合工業專科學校電子工程科助教　　(65年8月–73年7月)

私立聯合工商專科學校電子工程科講師　　(73年8月–84年7月)

私立聯合工商專科學校電子工程科主任　　(82年8月–85年7月)

國立聯合工商專科學校電子工程科講師　　(84 年 8 月–87 年 7 月)

國立聯合技術學院電子工程系講師　　(87 年 8 月–92 年 7 月)

國立聯合大學電子工程學系講師　　　(92 年 8 月~)

論文名稱：

具聯想學習之自回授比例記憶細胞式非線性網路

設計與分析及其聯想記憶之應用

THE DESIGN AND ANALYSIS OF THE
SELF-FEEDBACK RATIO-MEMORY CELLULAR
NONLINEAR NETWORKS AND THEIR
APPLICATIONS IN ASSOCIATIVE MEMORIES

PUBLICATION LIST

(A) JOURNAL PAPERS

[1] Jui-Lin Lai, and Chung-Yu Wu, "Architectural Design and Analysis of Learnable Self-Feedback Ratio-Memory Cellular Nonlinear Network (SRMCNN) for Nanoelectronic Systems," accepted by *IEEE Transactions on Vary Large Scale Integration systems*, 2004.

[2] Jui-Lin Lai, and Chung-Yu Wu, "A Learnable Self-Feedback Ratio-Memory Cellular Nonlinear Network (SRMCNN) with B templates for auto-Associative Memory Applications," submitted to *IEEE Transactions on Circuits and Systems.*

(B) CONFERENCE PAPERS

[1] Chung-Yu Wu and Jui-Lin Lai, "The Improvement of Pattern Learning and Recognition Capability in Ratio-Memory Cellular Neural Networks with Non-discrete-type Hebbian Learning Algorithm," in *2002 IEEE International Symposium on Circuits and Systems, ISCAS-2002 Proceeding*, May 2002, vol. I, pp.629-632.

[2] Jui-Lin Lai and Chung-Yu Wu, "A new Learnable Self-Feedback Ratio-Memory Cellular Nonlinear Network (SRMCNN) with B templates for Associative Memory Applications," in *2004 International Symposium on Nanoelectronic Circuits and Giga-scale Systems*, *ISNCGS-2004 Proceeding*, Feb. 2004, pp. 124-127.

[3] Jui-Lin Lai and Chung-Yu Wu, "A Learnable Self-Feedback Ratio-Memory Cellular Nonlinear Network (SRMCNN) for Associative Memory Applications," accepted by *IEEE ICECS 2004*, Dec. 2004.