

# CURRICULUM VITAE

## **Risto Miikkulainen**

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### **Education**

Doctor of Philosophy in Computer Science, University of California, Los Angeles, 1990.  
Master of Science in Engineering (Applied Mathematics), “with distinction”, Helsinki University of Technology, Finland, 1986.

### **Academic Positions**

Professor, Department of Computer Sciences, University of Texas at Austin, since 2002; Associate Professor, 1996 – 2002; Assistant Professor, 1990 – 1996.  
Faculty Member, Institute for Neuroscience, The University of Texas at Austin, since 2000.

### **Research Summary**

My research focuses on biologically-inspired computation such as neural networks and evolutionary computation. On one hand, the goal is to understand biological information processing, and on the other, to develop intelligent artificial systems that learn and adapt by observing and interacting with the environment. The three main focus areas are: (1) Neuroevolution, i.e. evolving complex deep learning architectures and recurrent neural networks for sequential decision tasks such as those in robotics, games, and artificial life; (2) Cognitive Science, i.e. models of natural language processing, memory, and learning that, in particular, shed light on disorders such as schizophrenia and aphasia; and (3) Computational Neuroscience, i.e. development, structure, and function of the visual cortex, episodic memory, and language processing.

### **Professional Positions**

Board of Governors, International Neural Network Society, 2007–2016.  
Computational Intelligence in Games Technical Committee, IEEE Computational Intelligence Society, Vice Chair 2007-2011, Member, 2007–2016.  
Scientific Advisory Board, Center of Excellence in Adaptive Informatics Research, Helsinki University of Technology, 2006–2011.  
VP of Research, Sentient Technologies, Inc., San Francisco, since 2017; Fellow, 2015-2017.  
Consultant, Centaur Technology, Inc., Austin, since 2015.  
Co-founder, Digital Certainty, Inc., Austin, 2011-2016 (acquired).  
Consultant, 21st Century Technologies, Inc., Austin, 2008-2010.  
Advisory Board, Lange Fund Management, LLC, Los Angeles, 2005-2006.  
Consultant, Catalis Healthcare / Recare Inc., Austin, 2000-2006.

## Editorships

*Scholarpedia*, curator, since 2015.

*IEEE Transactions on Computational Intelligence and AI in Games*, associate editor, 2008–2017.

*Cognitive Systems Research*, associate editor, 2000–2015.

*IEEE Transactions on Autonomous Mental Development*, associate editor, 2008–2014.

*Neural Networks*, associate editor, 2008–2011.

*Machine Learning*, action editor, 2002–2011.

*aigamereserch.org*, editorial board member, since 2013.

*Machine Learning*, editorial board member, since 2011.

*Evolutionary Intelligence*, editorial board member, since 2007.

*Encyclopedia of Machine Learning*, editorial board member, 2005–2011 (1st Edition); 2014 (2nd Edition).

*Neural Computing Surveys*, editorial board member, 1996–2001.

*Applied Intelligence*, editorial board member, 1995–2005.

*Neural Processing Letters*, editorial board member, 1994–2005.

*IEEE Transactions on Computational Intelligence and AI in Games*, Guest co-editor of a special issue on “Physics-Based Simulation Games,” 2016.

*Neural Networks*, Guest co-editor of a special issue on “Advances on Self-Organizing Maps,” 2005.

*IEEE Transactions on Evolutionary Computation*, Guest co-editor of a special issue on “Evolutionary Computation and Games,” 2005.

## Research Grants

National Institutes of Health, “Predicting Rehabilitation Outcomes In Bilingual Aphasia Using Computational Modeling,” (subcontract of a Boston University grant 1U01DC014922, PI Swathi Kiran), July 1st 2016 - June 30th 2021, \$1,118,097.

National Science Foundation, “BEACON: An NSF Science and Technology Center for the Study of Evolution in Action,” (subcontract of a Michigan State University grant DBI-0939454, PI Erik Goodman), August 1, 2010 - July 31st, 2020, ~\$4,500,000.

National Institutes of Health, “The Role of Emotion and Communication in Cooperative Behavior,” 1R01GM105042, September 2nd 2013 - July 31st 2017, \$929,113.

Army Research Office, “Neurometric Modeling: Computational Modeling of Individual Brains,” (PI David Ress), 59476-LS, June 1st 2012 - August 31st 2015, \$503,717.

IARPA, “Knowledge Representation as Embodied Abstractions: Theory and Experimental Validation” (subcontract of a Teledyne, Inc. grant, PI Mario Aguilar), November 15th 2013 - January 15th 2015, FA8650-14-C-7357, \$192,601.

National Science Foundation, “Learning Strategic Behavior in Sequential Decision Tasks,” IIS-0915038, September 1st 2009 - August 31st 2014, \$455,000

National Science Foundation, “A Predictive Simulation Model of Competitive Dynamics in Innovation,” SBE-0914796, September 1st 2009 - August 31st 2013, \$190,099.

National Institutes of Health, “Interdisciplinary Investigation of Biological Signatures of Autism Subtypes” (subcontract of University of California at Davis grant 1R01MH089626, PI David G. Amaral), September 30, 2009 - August 31, 2011, \$66,185.

National Science Foundation, “Pilot: Leveraging Human Creativity with Machine Discovery,” IIS-0757479, June 1st 2008 - May 31st 2011, \$199,967.

U.S. Army Medical Research Institute, “Neurometric Modeling: Computational Modeling of Individual Brains,” W911NF-10-1-0145, June 1st 2010 - February 28th, 2011, \$47,039.

Texas Higher Education Coordinating Board, “Constructing Intelligent Agents in Simulated Worlds” (003658-0036-2007), June 1st 2008 – January 31st, 2011, \$150,000.

National Institutes of Health, “Computational and Behavioral Evidence for Bilingual Aphasia Rehabilitation” (R21-DC009446), December 1st, 2008 - November 30th, 2011, \$401,180.

The Fetzer Institute, “A Formal Theory of Meditation” (subcontract of University of California at Davis grant, PI Clifford Saron), September 1st 2008 - August 31st 2011, \$86,418.

Google, Inc., “The OpenNERO AI Research and Education Platform,” September 1st, 2009, \$40,000.

National Science Foundation, “RI: Mastodon: A Large-Memory, High-Throughput Simulation Infrastructure” (CISE Research Infrastructure Grant EIA-0303609), September 1st 2003 - August 31st 2008, \$1,927,031.

National Institutes of Health, “Neural Network Models of Schizophrenic Language” (subcontract of Yale grant 5R01-MH066228, PI Ralph Hoffman), July 1st 2003 - June 30th 2008, \$185,196.

Defense Advanced Research Projects Agency, “Polymorphous Cognitive Agent Architecture (PCAA)” (subcontract of Lockheed Martin Advanced Technology Laboratories grant FA8750-04-C-0266, PI Julius Ettl), March 26th 2004 – August 31st 2006, \$700,000.

National Institutes of Health, “Computational Modeling of Cortical Maps” (Human Brain Project Grant 1R01-MH66991), April 22nd 2002 - March 31st 2006, \$765,500.

Toyota Technical Center, “Collision Avoidance through Neuroevolution Reinforcement Learning”, November 1st 2003 - January 15th 2006, \$333,750.

Defense Advanced Research Projects Agency, “Integrating Neuroevolution Learning into TIELT” (subcontract of NRL grant N00173041G025, PI David Aha), November 1st 2004 - October 31st 2005, \$27,000.

National Science Foundation, “Cooperative Coevolution of Neural Networks in Sequential Decision Tasks” (IIS-0083776), September 5th 2000 - August 31st 2004, \$419,114.

Texas Higher Education Coordinating Board, “Coevolution of Neural Networks for Multi-Agent Tasks” (ARP-003658-0476-2001), January 1st 2002 – December 31st, 2003, \$146,936.

National Science Foundation, “Modeling Development and Perceptual Phenomena in the Visual Cortex” (IIS-9811478), December 15th 1998 - November 30th 2001, \$231,377.

National Science Foundation, “Symbiotic Evolution of Neural Networks in Sequential Decision Tasks” (IRI-9504317), September 15th 1995 – August 31st, 1999, \$249,523.

Texas Higher Education Coordinating Board, “Natural Language Processing with Modular Neural Networks” (ARP-003658-444-1995), January 1st 1996 – August 31st, 1998, \$91,170.

National Science Foundation, “RIA: A Self-Organizing Neural Network Model of the Primary Visual Cortex” (IRI-9309273), June 15th 1993 – May 31st 1996, \$89,916.

## Awards and Honors

Outstanding Paper of the Decade (2002-2012) award of the International Society for Artificial Life for K. O. Stanley and R. Miikkulainen (2002), “Evolving Neural Networks Through Augmenting Topologies” *Evolutionary Computation*, 10:99–127.

Best-Paper Award in the Real-World Applications track, *Genetic and Evolutionary Computation Conference* (GECCO-2017, Berlin, Germany), for Yu, E. A., Yeom, J., Tutum, C. C., Vouga, E., and Miikkulainen, R. “Evolutionary Decomposition for 3D Printing.”

Bronze Medal, Human Competitive Results Competition, *Genetic and Evolutionary Computation Conference* (GECCO-2017, Berlin, Germany), for Miikkulainen, R., Iscoe, N., Shagrin, A., Cordell, R., Nazari, S., Schoolland, C., Brundage, M., Epstein, J., Dean, R. and Lamba, G. (2017) “Conversion Rate Optimization through Evolutionary Computation.”

Gabor Award, International Neural Network Society, 2017.

IEEE Fellow, since 2016

Distinguished Lecturer, IEEE Computational Intelligence Society, 2015-2017.

Best Paper Award in the Digital Entertainment and Arts track, *Genetic and Evolutionary Computation Conference* (GECCO-2015, Madrid, Spain), for Schrum, J., and Miikkulainen, R., “Solving Interleaved and Blended Sequential Decision-Making Problems through Modular Neuroevolution”

Best Paper Award in the Digital Entertainment and Arts track, *Genetic and Evolutionary Computation Conference* (GECCO-2014, Vancouver, Canada), for Schrum, J., and Miikkulainen, R., “Evolving Multimodal Behavior With Modular Neural Networks in Ms. Pac-Man.”

Deployed Application Award, *Innovative Applications of Artificial Intelligence Conference* (IAAI-2013, to A. Waters and R. Miikkulainen for “GRADE: Machine Learning Support for Graduate Admissions.”

Winner, BotPrize Award (successfully passing a Turing test for game bots), at the *IEEE Conference on Computational Intelligence in Games* (CIG-12, Grenada, Spain), for the UT<sup>2</sup> program of Igor Karpov, Jacob Schrum, and Risto Miikkulainen.

Honorable mention, 2012 Ziskind-Somerfield Research Award, Society of Biological Psychiatry, for the article “Using Computational Patients to Evaluate Illness Mechanisms in Schizophrenia” by Ralph E. Hoffman, Uli Grasemann, Ralitza Gueorguieva, Donald Quinlan, Douglas Lane, and Risto Miikkulainen.

Winner, Humanlike Bot competition (Turing test for game bots), at the *World Congress for Computational Intelligence* (WCCI-12, Brisbane, Australia), for the UT<sup>2</sup> program of Igor Karpov, Jacob Schrum, and Risto Miikkulainen.

Best Paper Award, *2011 IEEE Conference on Computational Intelligence and Games* (CIG-2011, Seoul, Korea), to J. Schrum and R. Miikkulainen for “Evolving Multimodal Networks for Multitask Games.”

First place, Sixth Annual Competition of Pseudo-Boolean Solvers, at the *Fourteenth International Conference on Theory and Applications of Satisfiability Testing* (SAT-2011, Ann Arbor, MI), for the Borg program of B. Silverthorn and R. Miikkulainen.

First place, Fifth Annual Competition of Pseudo-Boolean Solvers, at the *Thirteenth International Conference on Theory and Applications of Satisfiability Testing* (SAT-2010, Edinburgh, UK), for the Borg program of B. Silverthorn and R. Miikkulainen.

Best Student Paper Award, *IEEE Symposium on Computational Intelligence and Games* (CIG-2009, Milan, Italy), for Schrum, J. and Miikkulainen, R. on “Evolving Multi-modal Behavior in NPCs.”

Best Paper Award in Artificial Life, Evolutionary Robotics, Adaptive Behavior, and Evolvable Hardware, *Genetic and Evolutionary Computation Conference* (GECCO-2008, Atlanta, GA), for Valsalam, V., and Miikkulainen, R., “Modular Neuroevolution for Multilegged Locomotion.”

Best Paper Award in Generative and Developmental Systems, *Genetic and Evolutionary Computation Conference* (GECCO-2007, London, UK), for Reisinger, J. and Miikkulainen, R., “Acquiring Evolvability through Adaptive Representations.”

Best Student Paper Award, *IEEE Symposium on Computational Intelligence and Games* (CIG-2006, Reno, NV), for Bryant, B. and Miikkulainen, R., “Exploiting Sensor Symmetries in Example-based Training for Intelligent Agents.”

Best Paper Award in Evolutionary Robotics, A-Life, Adaptive Behavior, *Genetic and Evolutionary Computation Conference* (GECCO-2005, Washington, DC), for Valsalam, V., Bednar, J. A., and Miikkulainen, R., “Constructing Good Learners using Evolved Pattern Generators.”

Best Paper Award in Real World Applications, *Genetic and Evolutionary Computation Conference* (GECCO-2005, Washington, DC), for Sit, Y. F. and Miikkulainen, R., “Learning Basic Navigation for Personal Satellite Assistant using Neuroevolution.”

Bronze Medal, Human Competitive Results Competition, *Genetic and Evolutionary Computation Conference* (GECCO-2005, Washington, DC), for Grasemann, U. and Miikkulainen, R., “Effective Image Compression using Evolved Wavelets.”

Best Paper Award, *IEEE Symposium on Computational Intelligence and Games* (CIG-2005, Essex, UK), for Stanley, K. O., Bryant, B., and Miikkulainen, R., “Evolving Neural Network Agents in the NERO Video Game.”

Best Paper Award in Real World Applications, *Genetic and Evolutionary Computation Conference* (GECCO-2003, Chicago, IL), for Gomez, F. and Miikkulainen, R., “Active Guidance for a Finless Rocket Using Neuroevolution.”

Best Paper Award in Genetic Algorithms, *Genetic and Evolutionary Computation Conference* (GECCO-2002, New York, NY), for Stanley, K. and Miikkulainen, R., “Efficient Reinforcement Learning Through Evolving Neural Network Topologies.”

Francisco J. Varela Research Award, Mind and Life Institute, “Developing computational model for meditation using cross cortical synchrony in EEG data,” 2006–2009, \$10,000 (student: Manish Saggur).

Fellow on David Bruton Jr. Centennial Professorship #3 2005–2006, \$2000.

Dean’s Fellowship, College of Natural Sciences, the University of Texas at Austin, Spring 2002.

Faculty Fellowship, Department of Computer Sciences, the University of Texas at Austin, \$5,000–\$7,000 per year, 1995 – 2002.

National Institutes of Health, “The Source of Cross-Language Variation in Syllable Systems,” NIDCD National Research Service Award 1F32-DC00459-01, March 2000 – February 2002, \$65,748 (Postdoc: Dr. Melissa A. Redford).

Research Internship Award, The University of Texas at Austin, “Research Practice in Neuroevolution,” September 2001 - May 2002, \$18,500.

National Science Foundation (REU Supplement to grant IRI-9504317), April 1997 – September 1998, \$10,000.

National Science Foundation, “Synchronization and Segmentation in a Unified Neural Network Model of the Primary Visual Cortex,” IRI-940004P, 105 Service Units on Cray-90 and 119,000 SU on T3D at Pittsburgh Supercomputing Center, October 3rd 1994 – July 15th 1997.

High Performance Computer Time Grant, The University of Texas at Austin, “Handwritten Digit Recognition with the Laterally Interconnected Self-Organizing Map,” \$15,000 on the Cray J90, September 1st 1995 – August 31st 1996.

Special Research Grant, University Research Institute, the University of Texas at Austin, “Handwritten Digit Recognition with Laterally Connected Self-Organizing Maps”, February 1996, \$500.

College of Natural Sciences, the University of Texas at Austin, matching funds for equipment for the National Science Foundation Grant IRI-9504317, June 1995, \$11,000.

National Science Foundation, “A Self-Organizing Neural Network Model of the Primary Visual Cortex,” IRI-930005P, 1008 Service Units on Cray-90 at the Pittsburgh Supercomputing Center, June 23rd 1993 – January 15th 1995.

Summer Research Award, University Research Institute, the University of Texas at Austin, “Learning Abstractions with Distributed Neural Networks,” June – July 1991, \$10,222.

Max-Planck-Institute für Psycholinguistik, Nijmegen, the Netherlands, “Neural Network Models of Natural Language Processing,” May 1991, \$1,800.

Applied AI Systems, Ontario, Canada, “Gift to Support Natural Language Processing Research,” March 1991, \$1,000.

The Academy of Finland, “Neural Network Models of Natural Language Processing,” January 1987 – August 1990, \$34,000.

Emil Aaltonen Foundation Fellowship (Finland), 1986, 1989, 1990.

Foundation for the Advancement of Technology Fellowship (Finland), 1989, 1990.

Alfred Kordelin Foundation Fellowship (Finland), 1989.

Finnish Science Academy Fellowship, 1988.

Finnish Cultural Foundation Fellowship, 1987, 1988.

Jenny and Antti Wihuri Foundation Fellowship (Finland), 1987.

Thanks to Scandinavia Foundation Fellowship, 1987.

Economic and Technological Sciences Foundation Fellowship (Finland), 1986.

## Publications

Papers are available at [nn.cs.utexas.edu](http://nn.cs.utexas.edu), or directly by clicking on the title below.

## Books

1. Príncipe, J. P. and Miikkulainen, R. (editors) (2009). *Proceedings of the Seventh Workshop on Self-Organizing Maps*. LNCS 5629. Berlin: Springer.
2. Miikkulainen, R., Bednar, J. A., Choe, Y., and Sirosh, J. (2005). *Computational Maps in the Visual Cortex*. New York: Springer.
3. Sirosh, J., Miikkulainen, R., and Choe, Y. (editors) (1996). *Lateral Interactions in the Cortex: Structure and Function*. The UTCS Neural Networks Research Group, Austin, TX. Electronic book, ISBN 0-9647060-0-8, [nn.cs.utexas.edu/web-pubs/htmlbook96](http://nn.cs.utexas.edu/web-pubs/htmlbook96).
4. Miikkulainen, R. (1993). *Subsymbolic Natural Language Processing: An Integrated Model of Scripts, Lexicon, and Memory*. Cambridge, MA: MIT Press.

## Journal Articles

5. Lockett, A. and Miikkulainen, R. (2017). A Probabilistic Re-Formulation of No Free Lunch: Continuous Lunches Are Not Free. *Evolutionary Computation* 25:503–528.
6. Alden, M. and Miikkulainen, R. (2016). MARLEDA: Effective Distribution Estimation Through Markov Random Fields. *Theoretical Computer Science*, 633:4–18.
7. Schrum, J. and Miikkulainen, R. (2016). Solving Multiple Isolated, Interleaved, and Blended Tasks through Modular Neuroevolution. *Evolutionary Computation* 24:459–490.
8. Floren, A., Naylor, B., Miikkulainen, R., and Ress, D. (2015). Accurately Decoding Visual Information from fMRI Data Obtained in a Realistic Virtual Environment. *Frontiers in Human Neuroscience*, <https://doi.org/10.3389/fnhum.2015.00327>.

9. Schrum, J. and Miikkulainen, R. (2016). Discovering Multimodal Behavior in Ms. Pac-Man through Evolution of Modular Neural Networks. *IEEE Transactions on Computational Intelligence and AI in Games*, 8:67–81.
10. Saggarr, M., Zanesco, A. P., King B. G., Bridwell, D. A., MacLean, K. A., Aichele, S. R., Jacobs, T. L., Wallace, B. A., Saron, C. D., Miikkulainen, R. (2015). Mean-field thalamocortical modeling of longitudinal EEG acquired during intensive meditation training. *Neuroimage* 120:274–284.
11. Lehman, J. and Miikkulainen, R. (2015). Extinction Events Can Accelerate Evolution. *PLOS ONE*, DOI 10.1371/journal.pone.0132886.
12. Hausknecht, M., Lehman, J., Miikkulainen, R., and Stone, P. (2014). A Neuroevolution Approach to General Atari Game Playing. *IEEE Transactions on Computational Intelligence and AI in Games* 6:355–366.
13. Waters, A. and Miikkulainen, R. (2014). GRADE: Machine Learning Support for Graduate Admissions. *AI Magazine*.
14. Lockett, A. and Miikkulainen, R. (2014). Evolutionary Annealing: Global Optimization in Borel Measure Spaces. *Journal of Global Optimization* 58:75–108.
15. Lehman, J. and Miikkulainen, R. (2013). Neuroevolution. *Scholarpedia* 8(6):30977.
16. Valsalam, V. and Miikkulainen, R. (2013). Using Symmetry and Learning to Minimize Sorting Networks. *Journal of Machine Learning Research* 14:303–331.
17. Kiran, S., Grasemann, U., Sandberg, C., and Miikkulainen, R. (2013). A Computational Account of Bilingual Aphasia Rehabilitation. *Bilingualism: Language and Cognition* 16:325–342.
18. Valsalam, V., Hiller, J., MacCurdy, R., Lipson, H., and Miikkulainen, R. (2012). Constructing Controllers for Physical Multilegged Robots using the ENSO Neuroevolution Approach. *Evolutionary Intelligence* 5:45–56.
19. Saggarr, M., King, B. G., Zanesco, A. P., Maclean, K. A., Aichele, S. R., Jacobs, T. L., Bridwell, D. A., Shaver, P. R., Rosenberg, E. L., Sahdra, B. K., Ferrer, E., Tang, A. C., Mangun, G. R., Wallace, B. A., Miikkulainen, R., and Saron, C. D. (2012). Intensive Training Induces Longitudinal Changes in Meditation State-related EEG Oscillatory Activity. *Frontiers In Human Neuroscience* 6:256, doi:10.3389/fnhum.2012.00256.
20. Schrum, J. and Miikkulainen, R. (2012). Evolving Multimodal Networks for Multitask Games. *IEEE Transactions on Computational Intelligence and AI in Games*, 4:94–111.
21. Kohl, N. and Miikkulainen, R. (2012). An Integrated Neuroevolutionary Approach to Reactive Control and High-level Strategy. *IEEE Transactions on Evolutionary Computation* 16:472–488.
22. Valsalam, V. and Miikkulainen, R. (2011). Evolving Symmetry for Modular System Design.. *IEEE Transactions on Evolutionary Computation*, 15:368–386.
23. Hoffman, R.E., Grasemann, U., Gueorguieva, R., Quinlan, D., Lane, D., and Miikkulainen, R. (2011). Using Computational Patients to Evaluate Illness Mechanisms in Schizophrenia. *Biological Psychiatry* 69:997–1005.
24. Saggarr, M., Miikkulainen, R., and Schnyer, D. (2010). Behavioral, neuroimaging, and computational evidence for perceptual caching in repetition priming. *Brain Research* 1315:75–91.
25. Yong, C. H. and Miikkulainen, R. (2010). Coevolution of Role-Based Cooperation in Multi-Agent Systems. *IEEE Transactions on Autonomous Mental Development* 1:170–186.
26. Sit, Y. F., Chen, Y., Geisler, W. S., Miikkulainen, R., and Seidemann, E. (2009). Complex dynamics of V1 population responses explained by a simple gain-control model. *Neuron* 64:943–956.
27. Kohl, N. and Miikkulainen, R. (2009). Evolving Neural Networks for Strategic Decision-Making Problems. *Neural Networks* 22:326–337.

28. D'Silva, T. and Miikkulainen, R. (2009). Learning Dynamic Obstacle Avoidance for a Robot Arm Using Neuroevolution. *Neural Processing Letters* 30:59–69.
29. Sit, Y. F. and Miikkulainen, R. (2009). Computational Predictions on the Receptive Fields and Organization of V2 for Shape Processing. *Neural Computation* 21:762–785.
30. Gomez, F., Schmidhuber, J., and Miikkulainen, R. (2008) Accelerated Neural Evolution through Cooperatively Coevolved Synapses. *Journal of Machine Learning Research* 9:937–965.
31. Redford, M. and Miikkulainen, R. (2007). Effects of Acquisition Rate on Emergent Structure in Phonological Development. *Language* 83:737–769.
32. Silberman, Y., Bentin, S., and Miikkulainen, R. (2007). Semantic Boost on Episodic Associations: An Empirically Based Computational Model. *Cognitive Science* 31:645–671.
33. Sit, Y. F., and Miikkulainen, R. (2007). A Computational Model of the Signals in Optical Imaging with Voltage-Sensitive Dyes. *Neurocomputing* 70:1853–1857.
34. Valsalam, V., Bednar, J. A., and Miikkulainen, R. (2007). Developing Complex Systems using Evolved Pattern Generators. *IEEE Transactions on Evolutionary Computation* 11:181–198.
35. Miikkulainen, R. (2006). Creating Intelligent Agents in Games. *The Bridge*, 36(4):5–13.
36. Provost, J., Kuipers, B. J. and Miikkulainen, R. (2006). Developing navigation behavior through self-organizing distinctive state abstraction. *Connection Science* 18:159–172.
37. Sit, Y. F., and Miikkulainen, R. (2006). Self-Organization of Hierarchical Visual Maps with Feedback Connections. *Neurocomputing* 69:1309–1312.
38. Bednar, J. A., and Miikkulainen, R. (2006). Joint maps for orientation, eye, and direction preference in a self-organizing model of V1. *Neurocomputing* 69:1272–1276.
39. Jegelka, S., Bednar, J. A., and Miikkulainen, R. (2006). Prenatal Development of Ocular Dominance and Orientation Maps in a Self-Organizing Model of V1. *Neurocomputing* 69:1291–1296
40. Stanley, K., Bryant, B., and Miikkulainen, R. (2005). The NERO Real-time Video Game. *IEEE Transactions on Evolutionary Computation*, 9:653–668.
41. Silberman, Y., Miikkulainen, R., and Bentin, S. (2005). Associating Unseen Events: Semantically Mediated Formation of Episodic Associations. *Psychological Science* 16:161–166.
42. Whiteson, S., Kohl, N., Miikkulainen, R., and Stone, P. (2005). Evolving Keepaway Soccer Players through Task Decomposition. *Machine Learning* 59:5–30.
43. Bednar, J. A., De Paula, J., and Miikkulainen, R. (2005). Self-Organization of color opponent receptive fields and laterally connected orientation maps. *Neurocomputing* 65-66:69–76.
44. Mayberry, M. R. III and Miikkulainen, R. (2005). Broad-Coverage Parsing with Neural Networks. *Neural Processing Letters* 21:121-132.
45. Redford, M. A., Davis, B. L., and Miikkulainen, R. (2004). Phonetic Variability and Prosodic Structure in Motherese: Does One Mask the Other? *Infant Behavior and Development* 27:477–532.
46. Bednar, J. A., Kelkar, A., and Miikkulainen, R. (2004). Scaling Self-Organizing Maps to Model Large Cortical Networks. *Neuroinformatics* 2:275–302.
47. Bednar, J. A. and Miikkulainen, R. (2004). Prenatal and Postnatal Development of Laterally Connected Orientation Maps. *Neurocomputing* 58–60:985–992.
48. Bednar, J. A., Choe, Y., De Paula, J. B., Miikkulainen, R., Provost, J., Tversky, T. (2004). Modeling Cortical Maps with *Topographica*. *Neurocomputing* 58–60:1129–1135.
49. Stanley, K. and Miikkulainen, R. (2004). Competitive Coevolution through Evolutionary Complexification. *Journal of Artificial Intelligence Research* 21:63–100.
50. Choe, Y. and Miikkulainen, R. (2004). Contour Integration and Segmentation with Self-Organized Lateral Connections. *Biological Cybernetics*, 90:75–88.
51. Stanley, K. and Miikkulainen R. (2003). A Taxonomy for Artificial Embryogeny. *Artificial Life*, 9:93–130.



52. Bednar, J. A. and Miikkulainen, R. (2003). Self-Organization of Spatiotemporal Receptive Fields and Laterally Connected Direction and Orientation Maps. *Neurocomputing*, 52–54:473–480.
53. Choe, Y. and Miikkulainen, R. (2003). The Role of Postsynaptic Potential Decay Rate in Neural Synchrony. *Neurocomputing*, 52–54:707–712.
54. Bednar, J. A., and Miikkulainen, R. (2003). Learning Innate Face Preferences. *Neural Computation*, 15:1525–1557.
55. Stanley, K. and Miikkulainen, R. (2002). Evolution of Neural Networks through Augmenting Topologies. *Evolutionary Computation*, 10:99–127.
56. Bednar, J. A., Kelkar, A., and Miikkulainen, R. (2002). Modeling Large Cortical Networks with Growing Self-Organizing Maps. *Neurocomputing* 44–46:315–321.
57. Tversky, T. and Miikkulainen, R. (2002). Modeling Directional Selectivity Using Self-Organizing Delay-Adaptation Maps. *Neurocomputing* 44–46:679–684.
58. Redford, M., Chen, C.-C., and Miikkulainen, R. (2001). Constrained Emergence of Universals and Variation in Syllable Systems. *Language and Speech*, 44:27–56.
59. Bednar, J. A., and Miikkulainen, R. (2000). Tilt Aftereffects in a Self-Organizing Model of the Primary Visual Cortex *Neural Computation*, 12:1721–1740.
60. Howe, M., and Miikkulainen, R. (2000). Hebbian Learning and Temporary Storage in the Convergence-Zone Model of Episodic Memory. *Neurocomputing*, 32–33:817–821.
61. Choe, Y., Cormack, L., and Miikkulainen, R. (2000). Effects of Presynaptic and Postsynaptic Resource Redistribution in Hebbian Weight Adaptation. *Neurocomputing*, 32–33:77–82.
62. Agogino, A., Stanley, K., and Miikkulainen, R. (2000). Online Interactive Neuro-evolution. *Neural Processing Letters*, 11:29–38.
63. Choe, Y. and Miikkulainen, R. (1998) Self-Organization and Segmentation in a Laterally Connected Orientation Map of Spiking Neurons. *Neurocomputing*, 21:51–60.
64. Richards, N., Moriarty, D. E., and Miikkulainen, R. (1998). Evolving Neural Networks to Play Go. *Applied Intelligence*, 8:85–96.
65. Moriarty, D. E., and Miikkulainen, R. (1997). Forming Neural Networks through Efficient and Adaptive Coevolution. *Evolutionary Computation*, 5:373–399.
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### Editorials, Position Statements, Commentary, and Reviews

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## Software Systems

All software packages are available under the GNU General Public Software License at [nn.cs.utexas.edu](http://nn.cs.utexas.edu), or directly by clicking on the links below.

- MM-NEAT: software for Multiobjective evolution of modular neural networks, V1.0 May 2014, V1.1 October 2015 (with Jacob Schrum).
- OpenNERO simulation environment for research in multiagent systems, October 2008 (with Igor Karpov and John Sheblak), V2.0 February 2010 (with Igor Karpov, Daniel Lessin, Vinod Valsalam, Adam Dziuk, and Minh Pham), V2.1 August 2011 (with Igor Karpov and Adam Dziuk), V2011.12.14 December 2011 (with Igor Karpov), V2015.05.28 May 2015 (with Reza Mahjourian).
- BBMS: software for simulating troop movements and optimizing scout locations, May 2015 (with Brian Boyles).
- BREVE Monsters: software for exploring the evolution of multimodal behavior using neural networks, February 2014 (with Jacob Schrum).
- MARLEDA: distribution estimation using a Markov Random Field model, October 2013 (with Matthew E. Alden).
- mMARLEDA: multiobjective optimization using MARLEDA, October 2013 (with Matthew E. Alden).
- UT<sup>2</sup>: software for the BotPrize 2012 winning entry, September 2012 (with Igor Karpov and Jacob Schrum).
- PyEC software for Evolutionary Annealing and a number of other evolutionary and stochastic optimization algorithms. V0.1 May 2011 (with Alan Lockett), V0.2 in July 2012 (with Alan Lockett).
- ESL software for Egalitarian Social Learning in the robot foraging domain, June 2012 (with Eliana Feasley and Wesley Tansey).
- NEAT software for evolving neural network topologies. Versions: C++, v1.0 August 2001; v1.1 July 2002 (with Kenneth Stanley); v1.2 July 2010 (with Igor Karpov and Kenneth Stanley); v1.2.1 August 2011 (with Erkin Bahceci); Java, June 2002 (Ugo Vierucci); C++/ms, September 2002 (Mat Buckland); C#, April 2003 (Colin Green); Matlab, August 2003 (Christian Mayr); Delphi, December 2003 (Mattias Fagerlund); Java, June 2004 (Derek James and Philip Tucker).
- BORG algorithm portfolio software, July 2011 (with Bryan Silverthorn).
- CoSyNE: software for evolving neural networks through cooperative coevolution of synapses, Aug 2007; v1.2 May 2011 (with Faustino Gomez).
- NKVIS a visualization tool for NK fitness landscapes, May 2011 (with Erkin Bahceci).
- ENSO software for evolution of symmetric modular neural networks, November 2010 (with Vinod Valsalam).
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- NERO video game, based on real-time interactive neuroevolution, June 2005 (with Kenneth O. Stanley, Bobby Bryant, Aliza Gold, and the NERO development team); v1.1 November 2005; v2.0 August 2007.
- ESP software for evolving neural networks for sequential decision tasks: C++ version February 2000 (with Faustino Gomez); Java version v1.0 February 2002 (with Alan Oursland); v1.1 August 2007 (with Jacob Schrum).

rtNEAT package for evolutionary training of software agents in real time, February 2006 (with Kenneth O. Stanley).

Topographica software for simulating cortical maps (to accompany the *Computational Maps in the Visual Cortex NLP* book [1]), November 2005 (with James A. Bednar, Yoonsuck Choe, Judah De Paula, Jefferson Provost, and Yiu Fai Sit).

DEPTHSCOPE package for calculating depth and scope of innovation search from patent data, November 2005 (with Riitta Katila).

SOFM self-organizing map software, September 1994; v3.0 December 2002 (with Marty Mayberry).

SignalSim event-driven simulator of an interconnected network of spiking neurons, September 1990 (by Risto Miikkulainen); v2.0 December 2002 (with Marty Mayberry).

TEAM software for probabilistic model based evolution, July 2002 (with Matt Alden).

PGLISSOM software for modeling perceptual grouping in the visual cortex, March 2002 (with Yoonsuck Choe)

LISSOM software for self-organizing maps with lateral connections, July 1994 (with Joseph Sirosh); v2.0 October 1998; v3.0 November 2001 (with James A. Bednar).

SANE software for Symbiotic, Adaptive Neuro-Evolution for sequential decision tasks; C version v1.0 May 1996 (with David Moriarty); v2.0 May 1997 (with David Moriarty); v2.1 August 2000 (with Bram Stolk); Java version October 1998 (with Cynthia Matuszek).

MIR software for rapid prototyping of sentence processing architectures, October 1998 (with Marshall Mayberry).

Pole-balancing simulations for neuron-level SANE, February 1995 (with David Moriarty).

PROC connectionist story processing system, September 1994.

DISLEX lexicon model, September 1994.

HFM hierarchical feature maps, September 1994.

FGREPNET software for learning distributed word representations, September 1994.

SPEC subsymbolic sentence processing software, August 1994.

DISCERN story processing package (to accompany the *Subsymbolic NLP* book [3]), May 1993.

## Patents

Sherony, R., Miikkulainen, R., Stanley, K. O., and Kohl, N. (2009). Crash Prediction Network with Visual Input for Vehicle. United States Patent 7,613,569.

Sherony, R., Miikkulainen, R., Stanley, K. O., and Kohl, N. (2009). Crash Prediction Network With Graded Warning for Vehicle. United States Patent 7,565,231.

Stanley, K. O. and Miikkulainen R. (2009). Method and Apparatus for Providing Real-Time Machine Learning to Computer-Controlled Agents Used in Video Games. United States Patent 7,559,843.

Miikkulainen, R., Dahlin, M. D., and Lipscher, R. P. (2006). Systems and methods for adaptive medical decision support. United States Patent 6,988,088.

Twelve patents pending.

## Teaching

### Graduate Courses

Cognitive Science

Neural Networks  
Artificial Intelligence  
Research Practice and Experience

### **Undergraduate Courses**

Neural Networks  
Artificial Intelligence  
Computational Intelligence in Game Design I  
Computational Intelligence in Game Design II

### **Postdoctorals Supervised**

Cem Tutum, Clinical Assistant Professor, The University of Texas at Austin, since Spring 2015.  
Uli Grasemann, Research Educator, The University of Texas at Austin, Spring 2011 - Summer 2012; Senior Researcher, since Fall 2016.  
Padmini Rajagopalan, Fall 2016 – Summer 2017. Shell Inc., Bengaluru, India.  
Joel Lehman, Research Educator, The University of Texas at Austin, Fall 2012 - Fall 2014. Assistant Professor, IT University of Copenhagen.  
Kenneth O. Stanley, Fall 2004 – Fall 2005. Professor, University of Central Florida.  
Faustino Gomez, Fall 2003 – Spring 2004. Senior Researcher, IDSIA, Switzerland.  
James A. Bednar, Summer 2002 - Summer 2004. Senior Lecturer, University of Edinburgh.  
Melissa Redford, Spring 2000 - Spring 2002. Associate Professor, University of Oregon.  
Igor Farkas, Fall 1998. Associate Professor, Comenius University, Slovakia.  
Daniel Polani, Fall 1997. Reader, Department of Computer Science, University of Hertfordshire, UK.

### **Dissertations Supervised**

Padmini Rajagopalan, “The Evolution of Coordinated Cooperative Behaviors,” Fall 2016.  
Jeremy Stober, “Sensorimotor Embedding: A Developmental Approach to Learning Geometry,” Spring 2015. Apple, Inc.  
Erkin Bahceci, “Competitive Multi-Agent Search,” Fall 2014. Google, Inc.  
Daniel Lessin, “Open-Ended Behavioral Complexity for Evolved Virtual Creatures,” Fall 2014. Co-advisor Don Fussell. Postdoc, IT University of Copenhagen.  
Jacob Schrum, “Evolving Multimodal Behavior Through Modular Multiobjective Neuroevolution,” Spring 2014. Assistant Professor, Southwestern University.  
Austin Waters, “Analyzing Collections of Digital Media Documents with Hierarchical Bayesian Models,” Spring 2014. Google, Inc.  
Bryan Silverthorn, “A Probabilistic Architecture for Algorithm Portfolios,” Spring 2012. CTO, Angaza Design, Inc., Palo Alto, CA.  
Alan Lockett, “General-Purpose Optimization Through Information Maximization,” Spring 2012. Research Scientist, IDSIA, Switzerland.  
Manish Saggarr, “Computational Analysis Of Meditation,” Summer 2011. Co-advisor Cliff Saron, UC Davis. Postdoc, Stanford University.  
Uli Grasemann, “A Subsymbolic Model Of Language Pathology In Schizophrenia”, Fall 2010. Co-advisor Ralph Hoffman, Yale.



Vinod Valsalam, “Utilizing Symmetry in Evolutionary Design,” Summer 2010. Analyst, TwoSigma Inc., New York, NY.

Yiu Fai Sit, “A Population Gain Control Model of Spatiotemporal Responses in the Visual Cortex,” Summer 2009. Co-advisor Eyal Seidemann.

Nate Kohl, “Learning in Fractured Problems with Constructive Neural Network Algorithms”, Summer 2009. Software Engineer, Google Inc., New York, NY.

Tal Tversky, “Motion Perception and the Scene Statistics of Motion”, Spring 2008. Director of Risk Analytics, Apple Inc., Austin TX; co-advisor Wilson S. Geisler.

Matthew E. Alden, “MARLEDA: Effective Distribution Estimation Through Markov Random Fields”, Fall 2007. Lecturer, University of Washington, Tacoma.

Judah B. De Paula, “Modeling the Self-Organization of Color Selectivity in the Visual Cortex”, Fall 2007. Technical Manager, DuPont Pioneer Inc., Des Moines, IA; co-advisor James A. Bednar.

Jefferson Provost, “Reinforcement Learning in High-Diameter Environments”, Summer 2007. Data Scientist, Apple Inc., Austin TX; co-advisor Benjamin J. Kuipers.

Bobby D. Bryant, “Evolving Visibly Intelligent Behavior for Embedded Game Agents”, Fall 2006. Assistant Professor, Computer Science Department, University of Nevada, Reno.

Elizabeth C. Kaczmarczyk (Interdisciplinary), “The Acquisition Of Intellectual Expertise: A Computational And Empirical Theory,” Summer 2005.

Yaron Silberman (Hebrew University, Israel), “Characteristics of Forming Episodic Associations Between Words,” Spring 2005. VP, Medigus Inc.; co-advisor Shlomo Bentin.

Kenneth O. Stanley, “Efficient Evolution of Neural Networks through Complexification,” Summer 2004. Associate Professor, Computer Science, University of Central Florida.

Harold H. Chaput, “The Constructivist Learning Architecture: A Model of Cognitive Development for Robust Autonomous Robots,” Summer 2004. Technical Director, BioWare, Inc., Montreal, Canada; co-advisor Benjamin J. Kuipers.

Marshall R. Mayberry, III, “Broad-Coverage Parsing with Neural Networks,” Summer 2003.

Faustino Gomez, “Robust Nonlinear Control with Neuroevolution,” Summer 2003. Senior Researcher, IDSIA, Lugano, Switzerland.

Paul H. McQuesten, “Cultural Enhancement of Neuroevolution,” Summer 2002. Senior modeler, Elite Analytics, Inc.

James A. Bednar, “Self-Organization of Visual Function: Expressing Genetics through Learning,” Spring 2002. Bert Kay Best Dissertation Award, Department of Computer Sciences, The University of Texas at Austin. Senior Lecturer, School of Informatics, University of Edinburgh, UK.

Yoonsuck Choe, “Perceptual Grouping in a Self-Organizing Map of Spiking Neurons,” Summer 2001. Associate Professor, Department of Computer Science, Texas A&M University.

David Moriarty, “Symbiotic Evolution of Neural Networks in Sequential Decision Tasks,” Spring 1997. Director, Analytic Insight, Apple Inc., Austin TX.

Joseph Sirosh, “A Self-Organizing Neural Network Model of the Primary Visual Cortex,” Fall 1995. Corporate Vice President, Microsoft, Inc., Bellevue, WA.

Wee Kheng Leow, “VISOR: Learning Visual Schemas in Neural Networks for Object Recognition and Scene Analysis,” Spring 1994. Associate Professor, Department of Computer Science, National University of Singapore.

## **Masters Theses Supervised**

- Jason Zhi Liang, “Evolutionary Bilevel Optimization for Neuroevolution,” Spring 2015.
- Brian Boyles, “Optimizing Formation Observations Through Neuroevolution” Spring 2015.
- Anand Subramoney, “Evaluating Modular Neuroevolution in Robotic Keepaway Soccer,” Fall 2012.
- Vito Ruiz, “Adaptation in a Deep Network”, Spring 2011; co-advisor Jonathan Pillow.
- Aravind Gowrisankar, “Evolving Controllers for Simulated Car Racing Using Neuroevolution”, Fall 2008.
- Thomas W. D’Silva, “Evolving Robot Arm Controllers Using the NEAT Neuroevolution Method”, Spring 2006; co-advisor Benjamin Kuipers.
- German A. Monroy, “Coevolution of Neural Networks Using a Layered Pareto Archive”, Fall 2005.
- John Prior, “Eugenic Evolution for Combinatorial Optimization,” Spring 1998.
- Shailesh Kumar, “Confidence-Based Dual Reinforcement Q Routing: An On-line Adaptive Network Routing Algorithm,” Spring 1998.
- James A. Bednar, “Tilt Aftereffects in a Self-Organizing Model of the Visual Cortex,” Spring 1997.
- Rick Tanney (Philosophy), “Reflections in Silicon: Artificial and Natural Neural Networks,” Spring 1997; co-advisor Robert Causey.
- Justine Blackmore, “Visualizing High-Dimensional Structure with the Incremental Grid Growing Neural Network”, Fall 1995.
- Yoonsuck Choe, “Laterally Interconnected Self-Organizing Feature Map in Handwritten Digit Recognition.” Fall 1995.

## **Undergraduate Honors Theses Supervised**

- Patrick B. Haley, “The Evolution of Language Groups among Cooperating Predators,” Spring 2016.
- Matthew de Wet, “Avoiding Premature Convergence in Neuroevolution by Broadening the Evolutionary Search,” Fall 2010.
- Adam Dziuk, “Creating Intelligent Agents through Shaping of Coevolution,” Fall 2010.
- Chris Bush, “An Analysis of Automated Decision Making Methodologies in Role Playing Video Games: Centralized Approach,” Spring 2010.
- Matthew Johnston, “An Analysis of Distributed Decision Making Methodologies in Role Playing Video Games,” Spring 2010.
- Timothy Nodine, “Speciation in NEAT,” Spring 2010.
- David Robson, “Hierarchical Neural Networks for Behavior-Based Decision Making,” Spring 2010.
- Nathaniel Tucker, “Evolving Adaptive Intelligence: Using NeuroEvolution with Temporal Difference Methods in the Game Domain,” Spring 2009.
- Yonatan Bisk, “The Necessity of Separating Control and Logic when Grounding Language Using Neuroevolution,” Spring 2009.
- Christopher J. Clark, “A Computational Model of Distributed Neural Integration in the Brittlestar Sensorimotor System,” Fall 2007; co-advised with Jennifer Morgan.
- James Craver, “Example-based Training in Neuroevolution,” Fall 2007.
- Paul Williams, “Learning Visual Scene Descriptions: An Approach to Symbol Grounding,” Fall 2005.
- Ryan Cornelius, “Improving Prescribed Agent Behavior with Neuroevolution,” Spring 2005.
- Joseph Reisinger, “A Symbiotic Method for Modular Reuse and Problem Decomposition with NeuroEvolution,” Fall 2003.

Timothy Andersen, “Neuroevolution through Augmenting Topologies Applied to Evolving Neural Networks to Play Othello,” Spring 2002.

Brian Greer, “Numerical Optimization with Neuroevolution,” Fall 2001. AMD, Austin.

Andres Santiago Perez-Bergquist, “Applying ESP and Region Specialists to Neuro-Evolution for Go,” Spring 2001.

Chern Han Yong, “Cooperative Coevolution of Multi-Agent Systems,” Fall 2000.

Chun-Chi Chen, “Automatic Music Composition using Genetic Algorithm and Neural Networks: A Constrained Evolution Approach,” Fall 2000.

Todd Greer, “Evolving Hierarchical Neural Networks to Play Go,” Spring 1998.

Norman Richards, “Evolving Neural Networks to Play Go,” Fall 1996.

Rupert Tang, “A Connectionist Corpus-Based Approach to the Building of Word Representations,” Fall 1994.

James A. Bednar, “Multi-Level Neural Network Language Translator,” Spring 1993.

Brad Fullmer, “Evolving Finite State Behavior using Marker-Based Genetic Encoding of Neural Networks,” Spring 1991.

### **Current Student Supervision**

Advisor for eight PhD students in candidacy: Nora Aguirre (ITESM, Mexico), Kim Houck, Igor Karpov, Xun Li, Jason Liang, Reza Mahjourian, Elliot Meyerson, Aditya Rawal.

### **Dissertation and Thesis Evaluation**

External Evaluator of the Masters Thesis of Sunrise Wang, Department of Computer Science, University of Cape Town, “Evolving Controllable Emergent Crowd Behaviours with Neuro-Evolution,” James Gain and Geoff Nitschke, supervisors, Summer 2015.

External Evaluator of the dissertation of Royce R. Smart, School of Aerospace, Mechanical, and Manufacturing Engineering, RMIT University, Australia, “Evolutionary Control of Autonomous Underwater Vehicles,” John Wharington and Pavel Trivailo, supervisors, Fall 2008.

External Evaluator of the dissertation of Alon Keinan, School of Computer Science, Tel-Aviv University, Israel, “Localization of Function via Multi-Perturbation Analysis: Theory and Applications for the Analysis of Neural Networks,” Eytan Ruppim and Isaac Meilijson, supervisors, Fall 2005.

Dissertation Opponent for Krista Lagus, Department of Computer Science, Helsinki University of Technology, “Text Mining with the WEBSOM,” Erkki Oja, supervisor, Fall 2000.

External Evaluator of the dissertation of Samuel W. K. Chan, Department of Computer Science, University of New South Wales, Sydney, Australia, “Discourse Comprehension: A NeuroSymbolic Approach,” James Franklin, supervisor, Spring 1997.

External Evaluator of the dissertation of Heikki Hyötyniemi, Control Engineering Laboratory, Helsinki University of Technology, Finland “Self-Organizing Artificial Neural Networks in Dynamic Systems Modeling and Control,” Antti Niemi and Jouko Virkkunen, supervisors, Fall 1994.

Member of 62 completed and two current doctoral committees.

Member of four completed Masters committees and eight completed undergraduate honors thesis committees.

## Service

### Conference and Workshop Chair Positions

- Co-chair (with Chrisantha Fernando, Quoc Le, and Ken Stanley), “Metalearning,” Symposium at the *Neural Information Processing Systems* (NIPS 2017) conference, December 2017, Long Beach, CA.
- Track Co-Chair for Complex Systems, *Genetic and Evolutionary Computation Conference* (GECCO-2017, Berlin, Germany) 2016–2017.
- Track Co-Chair for Complex Systems, *Genetic and Evolutionary Computation Conference* (GECCO-2016, Denver, CO), 2015–2016.
- Co-chair, Workshop on Cognitive Computation: Integrating Neural and Symbolic Approaches, NIPS 2015.
- Co-chair, 10th International Workshop on Neural-Symbolic Learning and Reasoning (NeSy15), IJCAI 2015.
- Technical Program Co-Chair, *Congress on Evolutionary Computation* (CEC-2011, New Orleans, LA), 2011.
- Program Co-Chair, *The 2010 IEEE Conference on Computational Intelligence and Games* (CIG-10, Copenhagen, Denmark), 2010.
- Program Chair, “Workshop on Self-Organizing Maps” (WSOM-2009, St. Augustine, FL), 2009.
- Program Chair, *The Fourth IEEE Symposium on Computational Intelligence and Games* (CIG-08, Perth, Australia), 2008.
- Co-chair (with James A. Bednar), “Modeling Cortical Map Development,” Workshop at the *Tenth Annual Computational Neuroscience Meeting* (CNS\*2001), July 2001.
- Co-chair (with Joseph Sirosh), “Computational Role of Lateral Connections in the Cortex,” Workshop at the *Neural Information Processing Systems* (NIPS’94) conference, December 1994.

### Program Committees

- The 6th International Conference on the Theory and Practice of Natural Computing* (TPNC 2017, Prague, Czech Republic)
- Workshop on Self-Organizing Maps* (WSOM’16, Houston, TX), 2016.
- The 4th International Conference on the Theory and Practice of Natural Computing* (TPNC 2015, Mieres, Spain)
- Genetic and Evolutionary Computation Conference* (GECCO-15, Madrid, Spain), 2015.
- International Joint Conference on Neural Networks* (IJCNN’15, Killarney, Ireland).  
Senior Program Committee Member
- The 3rd International Conference on the Theory and Practice of Natural Computing* (TPNC 2014, Granada, Spain)
- Genetic and Evolutionary Computation Conference* (GECCO-14, Vancouver, Canada), 2014.
- International Joint Conference on Neural Networks* (IJCNN’14, Beijing, China), 2014.  
Senior Program Committee Member.
- Workshop on Self-Organizing Maps* (WSOM’14, Mittweida, Germany), 2014.
- International Joint Conference on Neural Networks* (IJCNN’13, Dallas, TX).  
Senior Program Committee Member
- Foundations of Digital Games Conference* (FDG, Crete), 2013.
- Congress on Evolutionary Computation* (CEC-13, Cancun, Mexico), 2013.
- Genetic and Evolutionary Computation Conference* (GECCO-13, Amsterdam, the Netherlands), 2013.

*Artificial Intelligence in Interactive Digital Entertainment Conference (AIIDE-12, Stanford, CA), 2012.*  
*Genetic and Evolutionary Computation Conference (GECCO-12, Philadelphia, PA), 2012.*  
*Congress on Evolutionary Computation (CEC-12, Brisbane, Australia), 2012.*  
*Evolutionary Computation in Games (EvoGAMES-12, Malaga, Spain), 2012.*  
*The 2011 IEEE Conference on Computational Intelligence and Games (CIG-11, Seoul, Korea), 2011.*  
*Artificial Intelligence in Interactive Digital Entertainment Conference (AIIDE-11, Stanford, CA), 2011.*  
*International Joint Conference on Neural Networks (IJCNN'11, San Jose, CA). Plenary Chair*  
*Workshop on Self-Organizing Maps (WSOM'11, Helsinki, Finland), 2011.*  
*Artificial Intelligence in Interactive Digital Entertainment Conference (AIIDE-10, Stanford, CA), 2010.*  
*The 2010 IEEE Conference on Computational Intelligence and Games (CIG-10, Copenhagen, Denmark), 2010.*  
*Genetic and Evolutionary Computation Conference (GECCO-10, Portland, OR), 2010.*  
*The 4th International Conference on Language and Automata Theory and Applications (LATA 2010, Trier, Germany)*  
*The Second European Conference on Bio-inspired Algorithms in Games (EvoGames 2010, Istanbul, Turkey), 2010.*  
*The Fifth IEEE Symposium on Computational Intelligence and Games (CIG-09, Milan, Italy), 2009.*  
*Artificial Intelligence in Interactive Digital Entertainment Conference (AIIDE-09, Stanford, CA), 2009.*  
*International Conference on Development and Learning (ICDL'09, Shanghai, China). Area Chair*  
*International Joint Conference on Neural Networks (IJCNN'09, Atlanta, GA). Vice Chair*  
*Genetic and Evolutionary Computation Conference (GECCO-09, Montreal, Canada), 2009.*  
*Evolutionary Computation and Games Session, Congress on Evolutionary Computation (CEC-09, Trondheim, Norway), 2009.*  
*International Conference on Development and Learning (ICDL'08, Asilomar, CA).*  
 Senior Program Committee Member  
*Artificial Intelligence in Interactive Digital Entertainment Conference (AIIDE-08, Stanford, CA), 2008.*  
*Genetic and Evolutionary Computation Conference (GECCO-08, Atlanta, GA), 2008.*  
*World Congress on Computational Intelligence (WCCI-2008, Hong Kong), 2008.*  
 Senior Program Committee member.  
*Thirtieth Annual Conference of the Cognitive Science Society (COGSCI-2008, Washington, DC), 2008.*  
 Senior Program Committee member.  
*Twentysecond National Conference on Artificial Intelligence (AAAI-07, Vancouver, Canada), 2007.*  
 Senior Program Committee member.  
*Twenty-ninth Annual Conference of the Cognitive Science Society (COGSCI-2007, Nashville, TN), 2007.*  
 Senior Program Committee member.  
*Genetic and Evolutionary Computation Conference (GECCO-07, London, UK), 2007.*  
*Innovative Applications of Artificial Intelligence (IAAI-07, Vancouver, Canada), 2007.*  
*Workshop on Self-Organizing Maps (WSOM'07, Bielefeld, Germany), 2007.*  
*The Third IEEE Symposium on Computational Intelligence and Games (CIG-07, Honolulu, HI), 2007.*  
*Language and Automata Theory and Applications (LATA-07, Tarragona, Spain), 2007.*  
*Innovative Applications of Artificial Intelligence (IAAI-06, Boston, MA), 2006.*  
*Genetic and Evolutionary Computation Conference (GECCO-06, Seattle, WA), 2006.*

*Twentyeighth Annual Conference of the Cognitive Science Society (COGSCI-2006, Vancouver, Canada), 2006. Senior Program Committee Member.*

*Twentyfirst National Conference on Artificial Intelligence (AAAI-06, Boston, MA), 2006.*

*The Second IEEE Symposium on Computational Intelligence and Games (CIG-06, Reno, NV), 2006.*

*Evolutionary Computation and Games Session, Congress on Evolutionary Computation (CEC-05, Edinburgh, UK), 2005.*

*Innovative Applications of Artificial Intelligence (IAAI-05, Pittsburgh, PA), 2005.*

*International Joint Conference on Neural Networks (IJCNN-05, Montreal, Canada), 2005.*  
Area chair for evolutionary methods.

*Genetic and Evolutionary Computation Conference (GECCO-05, Washington, DC), 2005.*

*Workshop on Self-Organizing Maps (WSOM'05, Paris, France), 2005.*

*The First IEEE Symposium on Computational Intelligence and Games (CIG-05, Essex, UK), 2005.*

*International Conference on Development and Learning (ICDL'04, San Diego, CA).*

*The 21st International Conference on Machine Learning (ICML-2004, Banff, Canada), 2004.*  
Area chair for Evolutionary Computation and Neural Networks.

*Evolutionary Computation and Games Session, Congress on Evolutionary Computation (CEC-04, Portland, OR), 2004.*

*Evolutionary Computation and Games Session, Congress on Evolutionary Computation (CEC-03, Canberra, Australia), 2003.*

*Genetic and Evolutionary Computation Conference (GECCO-03, Chicago, IL), 2003.*

*Workshop on Self-Organizing Maps (WSOM'03, Kitakyushu, Japan), 2003.*

*Understanding Coevolution: Theory and Analysis of Coevolutionary Algorithms. Workshop at the Genetic and Evolutionary Computation Conference (GECCO-02, New York, NY), 2002.*

*Genetic and Evolutionary Computation Conference (GECCO-02, New York, NY), 2002.*

*Second International Conference on Development and Learning (ICDL'02, Boston, MA).*

*The Second Workshop on Natural Language Processing and Neural Networks (NLPNN2001, Tokyo, Japan), 2001.*

*Workshop on Coevolution, Genetic and Evolutionary Computation Conference (GECCO-2001, San Francisco, CA), 2001.*

*Workshop on Self-Organizing Maps (WSOM'01, Lincoln, UK), 2001.*

*CELE-Twente Workshops on Natural Language Technology 2000: Learning to Behave (Ieper, Belgium).*

*ACAI-99 Workshop on Biologically Inspired Machine Learning (Crete, Greece), 1999.*

*Sixteenth National Conference on Artificial Intelligence (AAAI-99, Orlando, FL), 1999.*

*Genetic and Evolutionary Computation Conference (GECCO-99, Orlando, FL), 1999.*

*Fourth Argentine Congress on Computer Science (Buenos Aires, Argentina), 1998.*

*Workshop on Self-Organizing Maps (WSOM97, Helsinki, Finland), 1997.*

*Second Argentinian Congress on Computer Science (Buenos Aires, Argentina), 1996.*

*Eighteenth Annual Conference of the Cognitive Science Society (COGSCI-96, San Diego, CA), 1996.*  
Area chair for Computer Science.

*Thirteenth National Conference on Artificial Intelligence (AAAI-96, Portland, OR), 1996.*

## Reviewing

Journals: *Applied Intelligence*; *Artificial Intelligence*; *Behavior Research Methods, Instruments, and Computers*; *Behavior and Brain Sciences*; *Biological Cybernetics*; *Brain and Language*; *Cognitive Science*; *Connection Science*; *Decision Support Systems*; *Evolutionary Intelligence*; *IEEE Intelligent Systems*; *IEEE Transactions on Data Mining*; *IEEE Transactions on Evolutionary Computation*; *IEEE Transactions on Neural Networks*; *IEEE Transactions on Systems, Man, and Cybernetics*; *Infancy*; *Information and Computation*; *Information Processing Letters*; *International Journal of Computational Intelligence and Applications*; *International Journal of Intelligent Mechatronics*; *International Journal of Man-Machine Studies*; *International Journal of Neural Systems*; *Journal of Artificial Intelligence Research*; *Journal of Biological Chemistry*; *Journal of Machine Learning Research*; *Machine Learning*; *Network: Computation in Neural Systems*; *Neural Computation*; *Neural Computing Surveys*; *Neural Networks*; *Neural Processing Letters*; *Neurocomputing*; *Parallel Processing Letters*; *Philosophical Transactions of the Royal Society PLOS ONE*; *Proceedings of the National Academy of Sciences Psycology*; *Psychology of Learning and Motivation*; *Soft Computing*; *U.S. Navy Journal of Underwater Acoustics*.

Ad hoc reviewer for conferences: *International Conference on Artificial Neural Networks* (ICANN, Vienna, Austria), 2001; *Neural Information Processing Systems: Natural and Synthetic* (NIPS, Denver, CO), 1992, 1993, 1994, 1997, 1999; *The 1999 Conference of the Texas Linguistic Society: Perspectives on Argument Structure* (Austin, TX), 1998; *International Joint Conference in Artificial Intelligence* (IJCAI-97, Nagoya, Japan), in 1997; *IEEE International Conference on Tools with Artificial Intelligence* (New Orleans, LA) 1995; *IEEE Conference on Decision and Control*, 1992. *IEEE Conference on Decision and Control* (Tucson, AZ), 1992.

Member of the National Science Foundation review panels: Collaborative Research in Computational Neuroscience; Knowledge Models and Cognitive Systems; Perception, Action, and Cognition; Computational Cognition; Information and Intelligent Systems;

Ad hoc reviewer for NSF; NIH European Research Council Consolidator Grant Panel; Netherlands Organization for Scientific Research; Israel Science Foundation; European Science Foundation; NSERC (Canada); EPSRC (UK; Qatar National Research Fund; Marsden Foundation (New Zealand); Swiss National Science Foundation; National Research Foundation (South Africa); UT Research Grants.

Judge for the Siemens Westinghouse Competition Southwest Regional Finals, University of Texas at Austin, 2002.

Judge for AI XPrize, 2017.

## Memberships in Professional Societies

IEEE Computational Intelligence Society, since 2006.

IEEE, since 2006; senior member, 2014-2015; Fellow, since 2016.

ACM SIGEVO, since 2005.

ACM, since 2009.

Cognitive Science Society, since 1989.

International Neural Network Society, since 1987; Senior Member, since 2008.

Association for the Advancement of Artificial Intelligence, since 1987.

Society for Neuroscience 2002–2010

## **Invited Talks and Lectures**

### **On Evolution of Neural Networks**

Invited talk in the Symposium on Recurrent Neural Networks and Other Machines that Learn Algorithms at the *Neural Information Processing Systems Conference (NIPS 2016)*, Barcelona, Spain, December 2016.

Invited talk at the *IEEE MetroCon 2016* conference, Arlington, TX, October 2016.

SparkCognition, Inc, Austin, TX, August 2017.

Information Science Institute, University of Southern California, March 2017.

IEEE CIS Distinguished Lecture, Las Vegas Chapter, March 2016.

IEEE CIS Distinguished Lecture, Bogota Chapter, November 2015.

Invited talk at the Deep Learning Workshop at the *INNS Conference on Big Data*, San Francisco, CA, August 2015.

### **On Constructing Intelligent Agents Through Neuroevolution**

Keynote talk at the annual meeting of the *Korean Computer Scientists and Engineers Association in America*, San Jose, CA, December 2013.

Keynote talk at the *AAAI Fall Symposium on How Should Intelligence be Abstracted in AI Research*, Arlington, VA, November 2013.

Plenary talk at the *World Congress on Computational Intelligence* conference, Brisbane, Australia, June 2012.

Invited talk at the *IEEE MetroCon 2010* conference, Arlington, TX, September 2010.

Plenary talk at the *Seventh International Conference on Intelligent Systems Design and Applications*, Rio de Janeiro, October 2007.

IEEE CIS Distinguished Lecture, Reykjavik Chapter, February 2017.

Sentient Technologies, Inc., August 2015

Department of Mathematics and Computer Science, North Carolina A&T University, October 2013.

Advanced Analytics Institute, University of Technology Sydney, Australia, June 2012.

UT Austin ACM Student Chapter, October 2008.

MITRE Emerging Technologies Speaker Series, May 2008.

Computer Science Department, Michigan State University, November 2006.

Computer Science Department, University of Nevada, Reno, October 2006.

### **On Constructing Intelligent Agents in Games**

IEEE CIS Distinguished Lecture, Beijing Chapter, October 2017.

IEEE CIS Distinguished Lecture, Fort Worth Chapter, July 2015.

Invited talk at the *Neuromorphic Computing Workshop*, MITRE, McLean, VA, April 2008.

Invited talk at the *INNS Texas/MIND/UTA Conference on Goal-Directed Neural Systems*, Arlington, TX, November 2006.

Invited talk at the *National Academy of Engineering Frontiers of Engineering Conference*, Ann Arbor, MI, September 2006.

Keynote address at the *Game-On North America Conference*, Monterey, CA, September 2006.

Plenary talk at the *World Congress on Computational Intelligence*, Vancouver, BC, July 2006.



Keynote talk at the *IEEE Symposium on Computational Intelligence and Games*, April 2005.  
Invited talk at the *Conference on AI in Games*, the University of Texas at Austin, August 2003.  
Computer Science Department, University of Nevada, Reno, April 2007

### **On Solving Sequential Decision Tasks with Neuroevolution**

Invited talk at the *Road to Software Evolvability Workshop*, Santa Fe Institute, June 2005.  
Invited talk at the *AAAI Fall Symposium on Real-World Reinforcement Learning*, October 2004.  
Invited talk at the *CELE Workshop on Evolutionary Language Engineering 2*, Ieper, Belgium, November 2000.  
Invited talk at the *Neural Computing in Science and Technology Workshop*, Maale Hachamisha, Israel, October 1999.  
Keynote address at the *IASTED Conference on Artificial Intelligence and Soft Computing*, Banff, Canada, July 1997.  
Invited talk at the *Conference on Neural Networks for Novel High-Order Rule Formation*, Texas A&M University, May 1995.  
Computer Science Department, University of Michigan, April 2006.  
Computer Science Department, University College London, October 2005.  
International Computer Science Institute (ICSI), University of California, Berkeley, June 2005.  
Institute of Systems Engineering, Swiss Federal Institute of Technology (EPFL), May 2005.  
Toyota Technical Center, Ann Arbor, August 2004.  
School of Computing, National University of Singapore, July 2004.  
Department of Computer Science, Texas A & M University, November 2001.  
Department of Computer Science, University of Richmond, January 2001.  
ACM talk series, the University of Texas at Austin, October 2000.  
Center for Artificial Intelligence, ITESM, Monterrey, Mexico, May 2000.  
Department of Engineering, Cambridge University, UK, July 1998.  
Department of Computer Science, Tel Aviv University, Israel, June 1998.  
Faculty of Industrial Engineering, Technion, Israel, June 1998.  
Sigma Xi Society, The University of Texas at Austin, March 1998.  
Society of Computational Biology, The University of Texas at Austin, February 1998.  
Matematico e Informatico, Universidade Eduardo Mondlane, Maputo, Mozambique, Dec. 1996.  
Department of Computer Science, University of California, Irvine, July 1995.  
Department of Computer Science, University of Helsinki, Finland, June 1995.  
Computer Science Department, University of California, Los Angeles, April 1995.  
International Computer Science Institute (ICSI), University of California, Berkeley, March 1995.  
Department of Computer Science, Stanford University, March 1995.  
Department of Computer Science, Carnegie Mellon University, February 1995.

### **On Computational Modeling of Schizophrenic Language Processing**

Invited talk at the *Workshop on Self-Organizing Maps*, Houston, TX, January 2016.

Invited talk at the DARPA Workshop on *Narrative Networks (N2): The Neurobiology of Narratives*, San Francisco, CA, April 2011.

Invited talk at the Workshop on *Grand Challenges in Neural Computation II: Neuromimetic Processing and Synthetic Cognition*, Santa Fe, NM, February 2011.

Department of Computer Science, Southwestern University, April 2015.

Institute for Neuroscience, The University of Texas at Austin, January 2011.

### **On Dyslexic and Aphasic Impairments in a Self-Organizing Model of the Lexicon**

Invited talk at the *Second International Workshop on Neural Modeling of Brain and Cognitive Disorders*, University of Maryland, June 1998.

Invited talk at the *First Annual Woolfolk Lectures in Communication Sciences and Disorders*, San Antonio, February 1997.

Invited talk at the *Biennial Meeting of the World Federation of Neurology: Research Group on Aphasia and Cognitive Disorders*, Budapest, Hungary, June 1994.

Max-Planck-Institute für Psycholinguistik, Nijmegen, the Netherlands, May 1992.

Department of Cognitive Science, Johns Hopkins University, August 1991.

### **On Modeling the Development and Function in the Primary Visual Cortex**

Invited talk at the *Information Processing in the Visual System Workshop*, Mathematical BioSciences Institute, Ohio State University, April 2007

Invited talk at the *Sixth University of Texas Neuroscience Symposium*, February 2001.

Invited talk at the *Self-Organizing Systems Workshop*, UMIST, Manchester, UK, October 1999.

Invited talk at the *Workshop on Self-Organizing Maps (WSOM'99)*, Helsinki University of Technology, Finland, July 1999.

Invited talk at the *Fifth International Conference on Neural Information Processing (ICONIP-98)*, Kitakyushu, Japan, October 1998.

Neurobiology Club, the University of Texas at Austin, September 2009.

Department of Electrical Engineering and Computer Science, Rice University, April 2008.

Institute for Neuroscience, the University of Texas at Austin, November 2007.

Center for Theoretical Neuroscience, Columbia University, April 2006.

Redwood Center for Theoretical Neuroscience, University of California, Berkeley, April 2006.

Computer Science Department, Helsinki University of Technology, August 2005.

Computer Science Department, University of Maryland, April 2005.

Department of Computer Sciences, University of California, Los Angeles, March 2005.

Center for Perceptual Systems, the University of Texas at Austin, April 2003.

Computer Science Department, Helsinki University of Technology, December 2000.

Department of Mathematics, King's College London, UK, July 1998.

Faculty of Industrial Engineering, Technion, Israel, June 1998.

Society of Computational Biology, The University of Texas at Austin, November 1997.

Department of Brain and Cognitive Sciences, MIT, April 1997.

Center for Vision and Image Science, University of Texas at Austin, November 1996.  
Research Imaging Center, University of Texas Health Sciences Center at San Antonio, October 1996.  
Department of Informatics, University of Buenos Aires, Argentina, May 1996.  
Freshman honors seminar, The University of Texas at Austin, February 1996.  
Neuroinformatics Laboratory, University of Bielefeld, Germany, May 1995.  
Department of Psychology, Technical University of Braunschweig, Germany, May 1995.  
Department of Computer Science, University of Southern California, March 1995.  
Pittsburgh Supercomputing Center, February 1995.  
Laboratory of Information Technology, Helsinki University of Technology, Finland, June 1994.  
Centre for Neuro-Mimetic Systems, EPFL, Lausanne, Switzerland, March 1994.  
School of Engineering and Research in Computer Science and Electronics (EERIE), Nimes, France, March 1994.

### **On Convergence-Zone Episodic Memory**

Department of Informatics, University of Buenos Aires, Argentina, May 1996.  
Laboratory of Information Technology, Helsinki University of Technology, Finland, June 1995.  
Department of Cognitive Science, University of California, San Diego, April 1995.  
Center for Neural Basis of Cognition, Carnegie Mellon University, February 1995.

### **On Parsing Sentences with Subsymbolic Neural Networks**

Plenary talk at the *Annual Conference of the Italian Society of Philosophy of Language*, Noto, Italy, October 2002.  
Invited talk at *Emergentist Approaches to Language: the 28th Carnegie Mellon Symposium on Cognition*, CMU, May 1997.  
Invited talk at the *Workshop on Thought and Language*, Kyushu Institute of Technology, Japan, September 1997.  
Department of Linguistics, The University of Texas at Austin, March 1999.  
Center for Artificial Intelligence, ITESM, Monterrey, Mexico, November 1996.  
Department of Linguistics, The University of Texas at Austin, January 1996.

### **On Processing Narratives with Subsymbolic Neural Networks**

Invited talk at the *Third Twente Workshop on Language Technology*, University of Twente, the Netherlands, May 1992.  
Invited talk at the *International Workshop on Fundamental Research for the Next Generation of Natural Language Processing*, ATR International, Kyoto, Japan, July 1991.  
Department of Artificial Intelligence, Kyushu Institute of Technology, Japan, July 1991.  
Human Interface Laboratories, Nippon Telegraph and Telephone, Yokosuka, Japan, July 1991.

## On Subsymbolic Cognitive Science

Invited talk at the *21st Annual Conference of the Cognitive Science Society (COGSCI-99)*, Vancouver, Canada, August 1999.

Cognitive Science Club, the University of Texas at Austin, November 1993.

Computer Science Department, University of Twente, the Netherlands, May 1992.

Computer Science Industrial Forum, the University of Texas at Austin, February 1992.

Cognitive Science Club, the University of Texas at Austin, January 1992.

Computer Sciences Department Visiting Committee, University of Texas at Austin, October 1990.

## On Other Topics

“How Does Word Meaning Depend on Context?” Invited talk at the workshop on Cognitive Computation: Integrating Neural and Symbolic Approaches, *Neural Information Processing Systems conference (NIPS 2016)*, Barcelona, Spain, December 2016.

“Grounding Meaning in Perceptual Representations,” Invited talk at *Dagstuhl Seminar on Neural-Symbolic Learning and Reasoning*, September 2014

“Open-Ended Behavioral Complexity for Evolved Virtual Creatures.” Invited talk at the *BEACON Congress*, Michigan State University, August 2013.

“Technological Innovation as Competitive Search.” IBM Silicon Valley, April 2012 (jointly with Riitta Katila).

“Coevolution of Cooperative Behaviors in Simulated Predator & Prey Teams.” Invited talk at the *Biocomplexity XI: The Evolution of Cooperation Workshop*, Indiana University, December 2010.

“Evolving Neural Network Controllers for Multilegged Robots,” Department of Mechanical Engineering, Oregon State University, August 2010.

“Machines Gone Wild,” Science Study Break presentation, the University of Texas at Austin, March 2010.

“Modeling Cortical Maps with *Topographica*.” Glaser Lab, University of California, Berkeley, May 2006.

“Multiagent Learning Through Neuroevolution.” Invited talk at the *Information Science and Technology workshop on Distributed Cognitive Systems Focused on Team and Multiagent Learning*, Cambridge, MA, June 2004.

“Topographica: Computational Modeling of Cortical Maps.” Invited talk at the *Human Brain Project Annual Conference*, May 2003.

“Semantic Effect on Episodic Associations.” Invited talk at the *Computational Neuropsychology Workshop*, Neural Information Processing Systems conference (NIPS’01), Whistler, Canada, December 2001.

“Semantic Effect on Episodic Associations.” Department of Psychology, The University of Texas at Austin, September 2001.

## Panel Presentations, Review Talks, and Demonstrations

“OpenNERO: a Game Platform for AI Research and Education” by Igor Karpov, John Sheblak, and Risto Miikkulainen (2008). Contributed demonstration at the *Artificial Intelligence and Interactive Digital Entertainment Conference (AIIDE-2008)*, Stanford, CA, October 2008.

“NERO: Neuro-Evolving Robotic Operatives” by Igor Karpov, Thomas Nelson, Kenneth O. Stanley, and Risto Miikkulainen (2007). In *Video Program of the Twenty-Second AAAI Conference on Artificial Intelligence*.

- “Topographica: Computational Modeling of Neural Maps” by James A. Bednar, Christopher Ball, Yoonsuck Choe, Julien Ciroux, Judah De Paula, Yiu Fai Sit, Jefferson Provost, and Risto Miikkulainen. Demonstration at the *Annual Meeting of the Society for Neuroscience*, October 2006.
- “The NERO Machine Learning Game” by Kenneth O. Stanley, Igor Karpov, and Risto Miikkulainen. Contributed demonstration at the *Google Zeitgeist Conference*, Mountain View, CA, October 2006
- “Real-time Interactive Learning in the NERO Video Game,” by Kenneth O. Stanley, Igor Karpov, Risto Miikkulainen, and Aliza Gold. Intelligent Systems Demonstrations Program, *National Conference on Artificial Intelligence (AAAI-2006)*, Boston, MA, July 2006.
- “The NERO Video Game,” by Kenneth O. Stanley, Igor Karpov, Risto Miikkulainen, and Aliza Gold. Contributed demonstration at the *Second Artificial Intelligence and Interactive Digital Entertainment Conference (AIIDE-2006)*, Marina del Rey, CA, June 2006.
- “Topographica: Computational Modeling of Cortical Maps,” by James A. Bednar, Yoonsuck Choe, Judah De Paula, Risto Miikkulainen, Jefferson Provost, and Yiu Fai Sit. Invited demonstration at the NIMH Human Brain Project exhibit at the *Annual Meeting of the Society for Neuroscience*, November 2005.
- “Real-time Learning in the NERO Video Game,” by Kenneth O. Stanley, Ryan Cornelius, Risto Miikkulainen, Thomas D’Silva, and Aliza Gold. Contributed demonstration at the *First Artificial Intelligence and Interactive Digital Entertainment Conference (AIIDE-2005)*, Marina del Rey, CA, June 2005.
- “Topographica: Computational Modeling of Cortical Maps,” by Risto Miikkulainen, James A. Bednar, Yoonsuck Choe, Judah De Paula, Jefferson Provost, and Tal Tversky. Invited demonstration at the *Human Brain Project Annual Conference*, April 2004.
- “Topographica: Computational Modeling of Cortical Maps,” by Risto Miikkulainen, James A. Bednar, Yoonsuck Choe, Judah De Paula, Jefferson Provost, and Tal Tversky. Invited demonstration at the *Human Brain Project Annual Conference*, May 2003.
- “Topographica: Computational Modeling of Cortical Maps,” by James A. Bednar, Yoonsuck Choe, and Risto Miikkulainen. Invited demonstration at the NIMH Human Brain Project exhibit at the *Annual Meeting of the Society for Neuroscience*, November 2002.
- “Symbolic-Subsymbolic Hybrids?” Invited panel presentation at the *NIPS Workshop on Hybrid Neural Symbolic Integration*, December 1998.
- “SOM Research in the US.” Invited talk at *Workshop on Self-Organizing Maps*, (WSOM’97), Helsinki University of Technology, Finland, June 1997.
- “Integrated Connectionist Models: Building AI Systems on Subsymbolic Foundations.” Invited panel presentation at the *Sixth International Conference on Tools with Artificial Intelligence (ICTAI-94)*, New Orleans, November 1994.

## Research Visits

- Department of Mathematics, Helsinki University of Technology, Finland, June – August, 1999, and May – July, 1998.
- Department of Computer Sciences, San Luis National University, San Luis, Argentina, May – June, 1996.
- Max-Planck-Institute für Psycholinguistik, Nijmegen, the Netherlands, May 1992 and May 1991.
- Computer Science Department, University of Twente, the Netherlands, May 1992.

## Tutorials and Short Courses

- “Evolving Neural Networks.” Tutorial at the *Genetic and Evolutionary Computation Conference: GECCO-2017* (Berlin, Germany); *GECCO-2016* (Denver, CO); *GECCO-2015* (Madrid, Spain); *GECCO-2014* (Vancouver, Canada); *GECCO-2013* (Amsterdam, the Netherlands); *GECCO-2011* (Dublin,

Ireland); GECCO-2010 (Portland, OR); GECCO-2009 (Montreal, Canada); GECCO-2008 (Atlanta, GA); GECCO-2007 (London, UK); GECCO-2006 (Seattle, WA); GECCO-2005 (Washington, DC).

“Neuroevolution Reinforcement Learning.” Tutorial at the *AAAI Conference on Artificial Intelligence*: AAAI-2017 (San Francisco, CA); AAAI-2015 (Austin, TX)

“Evolving Neural Networks.” Tutorial at the *Artificial Life Conference*, Lyon, France, September 2017; New York, NY, August 2014; East Lansing, MI, July 2012.

“Evolving Neural Networks.” Tutorial at the *2015 IEEE Conference on Computational Intelligence and Games*, Tainan, Taiwan, August 2015.

“Evolving Neural Networks.” Tutorial at the *Machine-Learning Summer School*, Austin, TX, January 2015.

“Evolving Neural Networks.” Invited tutorial at the *Theory and Practice of Natural Computation Conference*, Caceres, Spain, December 2013

“Evolving Neural Networks.” Tutorial at the *International Joint Conference on Artificial Neural Networks*, Dallas, TX, August 2013; San Jose, CA, July 2011

“Evolving Neural Networks.” Tutorial at the *World Congress on Computational Intelligence*, Brisbane, Australia, June 2012.

“Evolving Neural Networks.” Tutorial at the *BEACON Congress*, Michigan State University, August 2010.

“Natural Language Processing with Symbolic Neural Networks.” A 10-hour course at the International PhD School in Formal Languages and Applications, Rovira i Virgili University, Tarragona, Spain, September 2004, 2005, 2006.

“Artificial Intelligence.” A 40-hour lecture course at the Department of Informatics, San Luis National University, San Luis, Argentina, June 3rd – 14th, 1996.

“Evolving Neural Networks with Genetic Algorithms.” A 40-hour lecture course at the Department of Informatics, San Luis National University, San Luis, Argentina, May 20th – 31st, 1996.

“Progress in Self-Organizing Feature Maps.” A short course presented at the Phoenix Corporate Research Laboratories, Motorola Inc, Phoenix AZ, July 7th, 1995.