

Gerard J. Rinkus 468 Waltham Street, Newton, MA 02465
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Education

- 2004-2006 Postdoc, Computational neuroscience, with John Lisman. Brandeis University. Jointly supported by NIH and The Redwood Neuroscience Institute.
- 1996 Ph.D., Cognitive & Neural Systems. Boston University, Boston, Mass.
 Advisor: Daniel H. Bullock, Associate Professor, Cognitive & Neural Systems
 Thesis: A Combinatorial Neural Network Exhibiting Episodic and Semantic Memory Properties for Spatio-Temporal Patterns.
- 1989-1990 Ph.D. Student (Teaching Asst.), Exper. Psych. Dept., NYU, New York, N.Y.
- 1986 M.A., Computer Science. Hofstra University, Hempstead, N.Y.
- 1983 B.A., Cognitive Science. University of Rochester, Rochester, N.Y.

Employment History

- Jan 2010-Present President & Chief Scientist, [Neurithmic Systems](#), Newton, MA**
 R&D on biologically-inspired, probabilistic, hierarchical associative memory for learning / recognition of spatiotemporal patterns, e.g., video, speech, biosequences.
- Jan 2007-July 2009 Senior Research Engineer, Scientific Systems Co Inc., Woburn, MA**
 Developed Models for automated content-based alignment/integration of heterogeneous databases, geospatial reasoning.
- April 2006-Dec 2006 Visiting Scientist, Brandeis University, Waltham, MA**
 Computational neuroscience. Developed intelligent, scalable sequence recognition algorithms (Java) and a canonical cortical microcircuit model. Swing/Java3D-based GUI visualization apps.
- Sept 2004-April 2006 Postdoc, Lisman Lab, Brandeis, Waltham, MA**
 Developed brain-inspired, hierarchical models of sequence learning/recognition. Support: NIH 5 T32 NS07292 & The Redwood Neuroscience Institute.
- June 1999-Oct 2003 Research Programmer, Enkidu Research. Lockport, NY**
 Developed apps for NIH/NIMH-supported R&D and commercial augmentative communication devices, including statistical text analysis, speech recognition, Web crawling, Web-based teaching.
- June 1996-June 1999 Senior Scientist, Charles River Analytics. Cambridge, MA**
 Managed/executed DoD/Nasa Phase I/II SBIRs developing Bayes nets, case-based reasoning, and other AI technologies for situation/threat assessment, cognitive state estimation, battlefield course-of-action estimation and planning.
- Sept 1992-Sept 1995 Research Programmer Army Research Lab, Watertown, MA**
 Developed data acquisition modules (GPIB/LabView), neural-net-based process control and analysis of tank shock absorber data.
- Sept 1990-Aug 1991 Asst. System Admin. Cognitive & Neural Systems, Boston University**
- Sept 1989-Aug 1990 Graduate Teaching Asst., Experimental Psychology, NYU, NY**
- Sept 1986-Aug 1988 Instructor, Math & Comp. Sci., Adelphi University, Garden City, NY**
 Developed curricula/materials, taught Assembler, Data Structures, advised students.
- July 1984-April 1986 Software Engineer, Hazeltine Inc. Greenlawn, NY**
 Developed Expert System for controlling the manufacture of printed circuit boards.

Patents

1. [Overcoding-and-Pruning: A bufferless chunking process and uses thereof](#) US Pat. 8,983,884
2. Methods and apparatus for sequence recognition using sparse distributed codes (pending)

Journal Papers

- Rinkus, G. ([arXiv](#)) A Radically New Theory of how the Brain Represents and Computes with Probabilities.
- [Rinkus, G. \(2014\)](#) Sparsey: Event recognition via deep hierarchical sparse distributed codes. *Frontiers in Neuroanatomy*. doi: 10.3389/fncom.2014.00160
- [Rinkus, G. \(2012\)](#) Quantum Computation via Sparse Distributed Representation. *NeuroQuantology* **10**(2) 311-315.
- [Rinkus, G. \(2010\)](#) A cortical sparse distributed coding model linking mini- and macrocolumn-scale functionality. *Frontiers in Neuroanatomy* 4:17. doi:10.3389/fnana.2010.00017
- Sincebaugh, P., Green, W. & Rinkus, G. (1996) A Neural Network Based Diagnostic Test System for Armored Vehicle Shock Absorbers. *Expert Systems with Applications*, **11**(2) 237-244.

Invited Talks

- 04/21/17: Sparse Distributed Coding Enables Super-Efficient Probabilistic Modeling. Intel Microarchitecture Technology Lab. Hillsboro, OR Host: Narayan Srinavasa
- 04/20/17: Sparse Distributed Coding Enables Super-Efficient Probabilistic Modeling. IBM Almaden Machine Intelligence Lab, San Jose, CA. Host: Winfried Wilcke
- 09/02/16: Sparsey[®]: Scalable Machine Intelligence via Hierarchical Sparse Distributed Representations. GE Global Research, Niskayuna, NY. Host: Joe Salvo
- 03/07/16: Sparse Distributed Representation Trumps Machine Parallelism for Improving Computational Efficiency. Neuro-Inspired Computational Elements (NICE 2016), Berkeley, CA
- 03/11/14: Sparse Distributed Coding & Hierarchy: The Keys to Scalable Machine Intelligence. DARPA UPSIDE Year 1 Review Presentation.
- 06/26/13: A Cortical Macrocolumn Model based on Sparse Distributed Representation. Large-Scale Applications Using Cortical Processing Models Wkshp, DARPA, Arlington, VA.
- 02/25/13: Constant-Time Probabilistic Learning & Inference via Hierarchical Sparse Distributed Representations. Neuro-Inspired Computational Elements (NICE) Workshop, Sandia Labs, Albuquerque. Feb 25-27. Host: Murat Okandan.
- 12/14/12: Probabilistic Computing via Sparse Distributed Representations. Lyric Semiconductor Theory Seminar. Host: Ben Vigoda.
- 08/31/09: Overcoding-and-Pruning: A Novel Neural Model of Temporal Chunking and Short-term Memory. Kreiman Lab, Dept. of Ophthalmology and Neuroscience, Children's Hospital, Boston. Host: Gabriel Kreiman.
- 10/07: A Functional Role for the Minicolumn in Cortical Population Coding. Cortical Modularity and Autism Symposium. The U. of Louisville, Health Sciences Center. Host: Manuel Casanova.
- 02/06: Hierarchical Sparse Distributed Representations of Sequence Recall and Recognition. The Redwood Center for Theoretical Neuroscience. (UC Berkeley). Host: Bruno Olshausen.
- 06/04: A Sparse Distributed Model of Episodic and Semantic Spatiotemporal Memory. Redwood Neuroscience Institute, Menlo Park, CA. Host: Fritz Sommer.

Selected Conference Papers, Posters, Chapters

- Rinkus (submitted) The Brain's Computational Efficiency derives from using Sparse Distributed Representations. *Cognitive Computational Neuroscience 2017*.
- Rinkus (2017) A Radically New Theory of How the Brain Represents and Computes with Probabilities. (Poster) *Neuro-Inspired Comp. Elements (NICE 2017)*, IBM Almaden, San Jose
- Rinkus, G. (2014) Cortex-inspired technology yields scalable probabilistic inference over events. (Poster) *IARPA Machine Intelligence from Cortical Networks (MICrONS) Wkshp: 2/11/14*
- Rinkus, G. (2013) A cortical theory of super-efficient probabilistic inference based on sparse distributed representations. *22nd Annual CNS Meeting, Paris, July 13-18. BMC Neuroscience 2013, 14(Suppl 1): P324*
- Rinkus, G. (2009) Overcoding-and-pruning: a bufferless neural chunking model. *Frontiers in Computational Neuroscience. COSYNE '09 Abstract: doi: 10.3389/conf.neuro.10.2009.03.292*
- Rinkus, G. (2008) Population Coding Using Familiarity-Contingent Noise. *AREADNE 2008: Research in Encoding and Decoding of Neural Ensembles*, Santorini, Greece, June 26-29
- Rinkus, G. & Lisman, J. (2005) Time-Invariant Recognition of Spatiotemporal Patterns in a Hierarchical Cortical Model with a Caudal-Rostral Persistence Gradient. *Society for Neuroscience Annual Meeting, 2005*. Washington, DC. Nov 12-16
- Rinkus, G. (2005) A Neural Network Model of Time-Invariant Spatiotemporal Pattern Recognition *First Annual Computational Cognitive Neuroscience Conference*, Washington, DC, Nov. 10-11
- Rinkus, G. (2004) A Neural Model of Episodic and Semantic Spatiotemporal Memory. *Proc. of the 26th Annual Conference of the Cognitive Science Society*. Kenneth Forbus, Dedre Gentner & Terry Regier, Eds. LEA, NJ. 1155-1160. Chicago, Ill.
- Leshner, G.W., Moulton, B.J., Rinkus, G. & Higginbotham, D.J. (2003) Software tools for emulation and analysis of augmented communication. *CSUN 2003*, California State University, Northridge.
- Leshner, G.W. & Rinkus, G. (2002) Leveraging word prediction to improve character prediction in a scanning configuration. *Proc. of the RESNA 2002 Annual Conference*, Reno.
- Leshner, G.W. & Rinkus, G. (2001) Domain-specific word prediction for augmentative communications. *Proc. of the RESNA 2002 Annual Conference*, Reno.
- Leshner, G.W. & Rinkus, G. (2001) Domain-specific word prediction for augmentative communications. *Proc. of the RESNA 2002 Annual Conference*, Reno.
- Leshner, G.W., Rinkus, G., Moulton, B.J., & Higginbotham, D.J. (2000) Logging and analysis of augmentative communication. *Proc. of the RESNA 2000 Annual Conference*, Reno. 82-85.
- Gonsalves, P.G. & Rinkus, G. (1998) Intelligent fusion and asset manager processor (IFAMP). *Proc. of the IEEE Information Technology Conference (Syracuse, NY) 15-18*.
- Rinkus, G. (1997) A Monolithic Distributed Representation Supporting Multi-Scale Spatio-Temporal Pattern Recognition. *International Conference on Vision, Recognition, and Action: Neural Models of Mind and Machine*, Boston University, Boston, Mass. May 29-31.
- Rinkus, G. (1995) TEMECOR: An Associative, Spatio-Temporal Pattern Memory for Complex State Sequences. *Proc. of 1995 World Congress on Neural Networks*, v. I, 442-448, Wash., DC
- Rinkus, G. (1993) Context-sensitive Spatio-temporal Pattern Memory. (1993) *Proc. of the 1993 World Congress on Neural Networks*, v. II, 344-347, Portland, OR.
- Rinkus, G. (1992) A Neural Model for Spatio-temporal Pattern Memory. *Proc. Wang Conference: Neural Networks for Learning, Recognition, and Control*, Boston University, Boston, Mass
- Rinkus, G. (1988) Learning as Natural Selection in a Sensori-Motor Being. *Proc. 1st Annual Conference of the Neural Network Society*, Boston, Mass.
- Mulgund, S., Rinkus, G., Illgen, C. & Zacharias, G. (1997) Situation Awareness Modeling and Pilot State Estimation for Tactical Cockpit Interfaces. *HCI International*, San Francisco, CA, August.

Mulgund, S.S., Illgen, C., Rinkus, G., Zacharias, G.L. & Friske, J. (1997) OLIPSA: On-Line Intelligent Processor for Situation Assessment. *Proc. of 2nd Ann. Symp. on Situational Awareness in the Tactical Air Environment*. NAWCAD, Patuxent River, Md. June 3-4.

Book Chapters

Mulgund, S.S., Zacharias, G.L. & Rinkus, G. (2003) Adaptive Pilot-Vehicle Interfaces for the Tactical Air Environment. in *Psychological Issues in the Design and Use of Virtual Adaptive Environments*. Hettinger, L.J. & Haas, M. (Eds.) LEA, NJ 483-524.

Theses

Rinkus, G. (1996) A Combinatorial Neural Network Exhibiting Episodic and Semantic Memory Properties for Spatio-Temporal Patterns. Ph.D. Thesis. Boston University, Boston, Mass.

Rinkus, G. (1986) Learning as Natural Selection in a Sensori-Motor Being. Master's Thesis. Hofstra University, Hempstead, N.Y.

Professional Activities

Program Committee: 1st International Workshop on Computational Models of the Visual Cortex, to be held Dec 2-5, NYC.

Program Committee: [Workshop on Unsupervised & Transfer Learning](#): ICML 2011, Bellevue, WA
Organization for Computational Neurosciences, Faculty Member, 2012-2014.

Presenter & Panel Discussant. IARPA Automatic Machine Learning Workshop (4/16-17, 2012),
NSF, Arlington, VA.

Funding

- Northrop Grumman: Awarded in response to NG RFQ 6000675674 (follow-on to Cortical Processing Algorithm) 7/15-1/16
- Northrop Grumman: Con# 8200176119 IRAD Cortical Processing Algorithm 1/21/14-4/21/14
- DARPA MTO (UPSIDE Program): FA8650-13-C-7432: Sparse Distributed Representation and Hierarchy: The Keys to Scalable Machine Intelligence: 4/29/13-12/30/15
- ONR 341: N00014-12-C-0539: Scalable Machine Vision via Hierarchical Sparse Distributed Representations: 8/15/2012-2/15/2014
- DARPA Deep Learning Program: Sub#337178J on Con#N00173-09-C-2038: 03/2010–05/2011
- NIH Postdoc Training Grant 5 T32 NS07292 (Brandeis) 9/2004-4/2006