

Curriculum Vitae

Cosma Rohilla Shalizi

Contact

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Sex Male
Nationality USA

Education

1993–2001: University of Wisconsin at Madison, Physics Department, Ph.D. Thesis title: *Causal Architecture, Complexity and Self-Organization for Time Series and Cellular Automata*. Advisers: James P. Crutchfield (physics) and David Griffeth (mathematics)

1990–1993: University of California at Berkeley, Physics Department, A.B.

Research

Positions

2006–: Assistant Professor, Statistics Department, Carnegie Mellon University.

2007–: External faculty, Santa Fe Institute.

2008–: Related faculty, Machine Learning Department, Carnegie Mellon University.

2005–2006: Visiting Assistant Professor, CMU Statistics.

2002–2005: Postdoctoral Research Fellow, Center for the Study of Complex Systems, University of Michigan.

2001–2002: Postdoctoral Fellow, Santa Fe Institute.

1998–2001: Graduate Fellow, SFI.

1997: Research assistant, Mathematics Department, UW-Madison.

Research Interests

Statistical analysis of complex systems models
Inference for stochastic processes: learning theory, nonparametric prediction
Networks: community discovery, dynamics, causal inference, cross-validation
Simulation-based inference
Inference and prediction with mis-specified models
Large deviations and ergodic theory in statistical inference
Functional connectivity in neural systems
Distributed information in biological computation
Inference for heavy-tailed distributions
Quantitative measures of self-organization and complexity
Cellular automaton models of pattern formation
Hidden Markov models and hidden Markov random fields
Foundations of statistical mechanics
Philosophy of science (causation; induction; reduction and emergence)

Grant Support

As PI “Model Complexity and Prediction Error in Macroeconomic Forecasting”,
Institute for New Economic Thinking, 2011–2013

As co-PI “New Statistical Methods for fMRI Applied to Visual Reference Frames
in Humans”, NIH (grant # 2 R01 NS047493), 2009– (PI: Christopher Genovese)

Publications

In Peer-Reviewed Journals and Conferences

1. Andrew Gelman and CRS, “Philosophy and the Practice of Bayesian Statistics”, *British Journal of Mathematical and Statistical Psychology* forthcoming, arxiv:1006.3868
2. Daniel J. McDonald, CRS and Mark Schervish, “Estimating beta-mixing Coefficients”, in *Proceedings of the 14th Conference on Artificial Intelligence and Statistics* [AISTATS 2011], arxiv:1103.0941
3. CRS and Andrew C. Thomas, “Homophily and Contagion Are Generically Confounded in Observational Social Network Studies”, *Sociological Methods and Research* **40** (2011): 211–239, arxiv:1004.4704
4. Shinsuke Koyama, Lucia Castellanos Pérez-Bolde, CRS, and Robert E. Kass, “Approximate Methods for State-Space Models”, *Journal of the American Statistical Association* **105** (2010): 170–180, arxiv:1004.3476
5. Robert Haslinger, Kristina Lisa Klinkner and CRS, “The Computational Structure of Spike Trains”, *Neural Computation* **22** (2010): 121–157, arxiv:1001.0036

6. CRS, “Dynamics of Bayesian Updating with Dependent Data and Misspecified Models”, *Electronic Journal of Statistics* **3** (2009): 1039–1074, arxiv:0901.1342
7. Aaron Clauset, CRS and M. E. J. Newman, “Power-law distributions in empirical data”, *SIAM Review* **51** (2009): 661–703, arxiv:0706.1062. Over 800 citations as of October 2011 (Google Scholar)
8. CRS, “Social Media as Windows on the Social Life of the Mind”, forthcoming in the proceedings of the AAAI 2008 spring symposium on social information processing, arxiv:0710.4911
9. CRS, Marcelo F. Camperi and Kristina Lisa Klinkner, “Discovering Functional Communities in Dynamical Networks”, pp. 140–157 in Anna Goldenberg *et al.* (eds.), *Statistical Network Analysis: Models, Issues, and New Directions* (New York: Springer-Verlag, 2007) [proceedings of a workshop at ICML 2006], arxiv:q-bio.NC/0609008
10. CRS, Robert Haslinger, Jean-Baptiste Rouquier, Kristina Lisa Klinkner and Cristopher Moore, “Automatic Filters for the Detection of Coherent Structure in Spatiotemporal Systems”, *Physical Review E* **73** (2006): 036104, arxiv:nlin.CG/0508001
11. Kristina Lisa Klinkner, CRS and Marcelo F. Camperi, “Measuring Shared Information and Coordinated Activity in Neuronal Networks”, pp. 667–674 in Yair Weiss, Bernhard Schölkopf and John C. Platt (eds.), *Advances in Neural Information Processing Systems 18* [NIPS 2005] (Cambridge, Massachusetts: MIT Press, 2006), arxiv:q-bio.NC/0506009
12. Michael T. Gaster, CRS and M. E. J. Newman, “Maps and Cartograms of the 2004 US Presidential Election Results”, *Advances in Complex Systems* **8** (2005): 117–123
13. Matthew J. Berryman, Scott W. Coussens, CRS, Yvonne Pamula, David Parsons, Kurt Lushington, David Saint, Andrew Allison, A. James Martin, Declan Kennedy and Derek Abbott, “Nonlinear Aspects of EEG Signals from Sleep Patients”, pp. 40–48 in Nigel G. Stocks, Derek Abbott and Robert P. Morse (eds.), *Fluctuations and Noise in Biological, Biophysical, and Biomedical Systems III* (Bellingham, Washington: SPIE, 2005), arxiv:q-bio.NC/0506015
14. CRS, Kristina Lisa Klinkner and Robert Haslinger, “Quantifying Self-Organization with Optimal Predictors”, *Physical Review Letters* **93** (2004): 118701, arxiv:nlin.AO/0409024
15. CRS and Kristina Lisa Klinkner, “Blind Construction of Optimal Nonlinear Recursive Predictors for Discrete Sequences”, pp. 504–511 in Max Chickering and Joseph Halpern (eds.), *Uncertainty in Artificial Intelligence: Proceedings of the Twentieth Conference* [UAI 2004] (Arlington, Virginia: AUAI Press, 2004), arxiv:cs.LG/0406011
16. CRS, “Functionalism, Emergence and Collective Coordinates”, *Behavioral and Brain Sciences* **27** (2004): 635–636

17. CRS, “Optimal Nonlinear Prediction of Random Fields on Networks”, *Discrete Mathematics and Theoretical Computer Science*, **AB(DMCS)** (2003): 11–30; arxiv:math.PR/0305160 (proceedings of the conference “Discrete Models for Complex Systems 2003”)
18. CRS and James P. Crutchfield, “Information Bottlenecks, Causal States, and Statistical Relevance Bases: How to Represent Relevant Information in Memoryless Transduction”, *Advances in Complex Systems*, **5** (2002): 91–95, arxiv:nlin.AO/0006025
19. Wim Hordijk, CRS and James P. Crutchfield, “An Upper Bound on the Products of Particle Interactions in Cellular Automata”, *Physica D* **154** (2001): 240–258, arxiv:nlin.CG/0008038
20. CRS and James P. Crutchfield, “Computational Mechanics: Pattern and Prediction, Structure and Simplicity”, *Journal of Statistical Physics* **104** (2001): 817–879, arxiv:cond-mat/9907176. Over 140 citations as of October 2011 (Google Scholar)
21. James P. Crutchfield, David P. Feldman and CRS, “Comment on ‘Simple Measure for Complexity’”, *Physical Review E* **62** (2000): 2996–2997, arxiv:nlin.CD/9907001
22. Cristopher Moore, Mats G. Nordahl, Nelson Minar and CRS, “Vortex Dynamics and Entropic Forces in Antiferromagnets and Antiferromagnetic Potts Models”, *Physical Review E* **60** (1999): 5344–5351, arxiv:cond-mat/9902200
23. James P. Crutchfield and CRS, “Thermodynamic Depth of Causal States: Objective Complexity via Minimal Representation”, *Physical Review E* **59** (1999): 275–283; arxiv:cond-mat/9808147

Invited and Contributed Papers

1. Andrew Gelman and CRS, “Philosophy and the practice of Bayesian statistics in the social sciences”, in Harold Kincaid (ed.), *Oxford Handbook of the Philosophy of the Social Sciences* (New York: Oxford University Press, forthcoming)
2. CRS, “Graphs, Trees, Materialism, Fishing: Reflections on Moretti”, pp. 115–139 in Jonathan Goodwin and John Holbo (eds.), *Reading Graphs, Maps, Trees* (Anderson, SC: Parlor Press, 2011); http://www.thevalve.org/go/valve/article/graphs_trees_materialism_fishing/
3. CRS, “Methods and Techniques in Complex Systems Science: An Overview”, pp. 33–114 in Thomas S. Deisboeck and J. Yasha Kresh (eds.), *Complex Systems Science in Biomedicine* (New York: Springer-Verlag, 2006); arxiv:nlin.AO/0307015
4. CRS and Kristina Lisa Klinkner, “Quantifying Self-Organization in Cyclic Cellular Automata”, pp. 108–117 in Lutz Schimansky-Geier, Derek Abbott, Alexander Neiman and Christian Van den Broeck (eds.), *Noise in Complex Systems and Stochastic Dynamics* (Bellingham, Washington: SPIE, 2003), arxiv:nlin.AO/0507067

5. Derek Abbott, Paul C. W. Davies and CRS, “Order from Disorder: The Role of Noise in Creative Processes. A Special Issue on Game Theory and Evolutionary Processes — Overview”, *Fluctuation and Noise Letters*, vol. 2, no. 4 (December 2002)

Submitted Papers

1. Henry Farrell and CRS, “Selection, Evolution, and Rational Choice Institutionalism”, submitted to *Rationality and Society*
2. Daniel J. McDonald, CRS and Mark Schervish, “Estimating beta-mixing Coefficients via Histograms”, submitted to *Bernoulli*, arxiv:1109.5998
3. Daniel J. McDonald, CRS and Mark Schervish, “Risk bounds for time series without strong mixing”, arxiv:1106.0730
4. Daniel J. McDonald, CRS and Mark Schervish, “Estimating VC Dimension for Risk Bounds”, arxiv:1111.3404
5. CRS, “Scaling and Hierarchy in Urban Economies”, arxiv:1102.4101
6. CRS, Abigail Z. Jacobs, Kristina Lisa Klinkner and Aaron Clauset, “Adapting to Non-Stationarity with Growing Expert Ensembles”, arxiv:1103.0949
7. CRS and Alessandro Rinaldo, “Consistency under Sampling of Exponential Random Graph Models”, submitted to *Annals of Statistics*, arxiv:1111.3054

Miscellaneous Manuscripts

1. Matthew J. Berryman, Scott W. Coussens, Sarah Blunden, CRS, Andrew Allison and Derek Abbott, “Methods for Analysis of EEG and EOG Data in Sleep Patients” (2004)
2. Shinsuke Koyama, Lucia Castellanos Pérez-Bolde, CRS, and Robert E. Kass, “Laplace’s Method in Neural Decoding” (2007)
3. Daniel J. McDonald, CRS and Mark Schervish, “Stationarity regularizes autoregressive models”, arxiv:1103.0942
4. CRS, Kristina Lisa Klinkner and James P. Crutchfield, “An Algorithm for Pattern Discovery in Time Series” Technical Report, Santa Fe Institute, 2002-10-60, arxiv:cs.LG/0210025
5. CRS, *Causal Architecture, Complexity and Self-Organization in Time Series and Cellular Automata*, Ph.D. Thesis, UW-Madison (2001), <http://bactra.org/thesis/>. With over 160 citations as of October 2011 (Google Scholar)
6. CRS, “Lecture Notes on Probability, Statistics and Stochastic Processes” (2000), <http://bactra.org/prob-notes/>.

7. CRS, “Maximum Likelihood Estimation and Testing for q -Exponential Distributions”, arxiv:math.ST/0701854
8. CRS, “The Backwards Arrow of Time of the Coherently Bayesian Statistical Mechanic”, arxiv:cond-mat/0410063
9. CRS and David J. Albers, “Symbolic Dynamics for Discrete Adaptive Games”, arxiv:cond-mat/0207407
10. CRS and James P. Crutchfield, “Pattern Discovery and Computational Mechanics” (2000), cs.LG/0001027.
11. CRS and Christopher Moore, “What Is a Macrostate? Subjective Observations and Objective Dynamics”, arxiv:cond-mat/0303625
12. CRS and William A. Tozier, “A Simple Model of the Evolution of Simple Models of Evolution” (1999), arxiv:nlin.AO/9910002 Rejected by *Theoretical Population Biology*.
13. CRS, “Lecture Notes on Computational Mechanics” (1998), <http://bactra.org/comp-mech-lectures/>.

Manuscripts in Preparation

1. Christopher Genovese, Eli Merriam and CRS, “Detection of Functional Modules in fMRI Data”
2. Justin Gross and CRS, “Cosponsorship in the U.S. Senate: A Multilevel Approach to Detecting the Influence of Social Relations on Legislative Behavior”
3. Henry Farrell and CRS, “Mechanisms of Contested Institutional Evolution”
4. Georg M. Goerg, CRS and Larry Wasserman, “Lebesgue Smoothing”
5. Georg M. Goerg, CRS and Larry Wasserman, “Nonparametric Prediction and Automated Pattern Recognition in Spatiotemporal Dynamics”
6. Kristina Lisa Klinkner and CRS, “Nonparametric Classification of Time Series”
7. Daniel J. McDonald, CRS, and Mark Schervish, “Nonparametric Risk Bounds in Time Series Econometrics”
8. Edward McFowland and CRS, “Congressional Leadership and the Flow-of-Funds Network”
9. CRS, “Bayesian Learning, Evolutionary Search, and Information Theory”
10. CRS, “Cross-validation via Measure Concentration for Mixing Processes”
11. CRS, “General Factors in Correlational Psychology: Artifacts or Myths?”

12. CRS, “Large Deviations in Exponential Families of Stochastic Automata”
13. CRS, *Measuring Complexity*
14. CRS, “Neutral Cultural Evolution in Assortative Social Networks”
15. CRS, “Predictive Markovian Representations of Stochastic Processes”
16. CRS, “A Quantitative Measure of Emergence”
17. CRS, *Statistical Analysis of Complex Systems* (Cambridge University Press), <http://www.stat.cmu.edu/~cshalizi/stacs>
18. CRS and Dean Eckles, “What Does Random Peer Assignment Identify?”
19. CRS, Kristina Lisa Klinkner, and Alessandro Rinaldo, “A Discovery Algorithm for a Class of Predictive State Representations”
20. CRS and Aryeh (Leonid) Kontorovich, “Predictive PAC Learning and Process Decompositions”
21. CRS with Aryeh (Leonid) Kontorovich, *Almost None of the Theory of Stochastic Processes*, <http://www.stat.cmu.edu/~cshalizi/almost-none>
22. CRS and Shawn Mankad, “Statistical Properties of Aggregated Random Graphs”
23. CRS and Alessandro Rinaldo, “Projective Structure and Parametric Inference in Dependent Exponential Families”
24. CRS and Andrew C. Thomas, “Identifying Social Contagion in Networks through Community Discovery”

Teaching

Classes

2010–: Lecturer, statistical inference, prediction and complexity measures, SFI Complex Systems Summer School.

2006–: Assistant Professor, Statistics Department, CMU. Courses taught: statistical computing (36-350); undergraduate advanced data analysis (36-402); data mining (36-350); graduate advanced data analysis (36-757); advanced theory of stochastic processes (36-754); chaos, complexity, and inference (36-462); undergraduate research (36-490); financial time series analysis (46-929); foundations of statistical modeling (36-835); directed reading courses for graduate students and advanced undergraduates. Major adviser to one half (≈ 40) of the undergraduates in the joint Economics-Statistics major (from 2010)

2005–2006: Visiting Assistant Professor, Statistics Department, CMU. Engineering statistics and quality control (36-220); stochastic processes (36-754).

2005, 2006: Lecturer, statistical inference and prediction, SFI Beijing Complex Systems Summer School.

2002: Instructor, foundational and methodological issues in complex systems, SFI

Complex Systems Summer School.

2001: Instructor, foundations of complex systems (probability, statistics, networks), SFI Complex Systems Summer School.

2000: Instructor for probability, statistics and stochastic processes, SFI Complex Systems Summer School.

1996: Teaching assistant at UW-Madison for Psychology-Anthropology-Zoology-Neuroscience 619, “Biology of Mind”, a writing-intensive interdisciplinary course on the biological foundations of behavior, cognition, and consciousness, and their evolution.

1994–1997: TA, Physics Department, UW-Madison. Taught discussion and lab sections for a range of introductory physics courses.

Research Students

UNDERGRADUATES: Jacob Usinowicz (2002); Jean-Baptiste Rouquier (2004); Akiko Takeda (2006); Shawn Mankad (2006–2008); Francis Keith (2007); Edward McFowland (2008–); Abigail Jacobs (2010–)

GRADUATE STUDENTS: Matthew Berryman (2004); Susan Buchman (Advanced Data Analysis project, 2005–2007); Justin Gross (ADA, 2006–2007); Stacey Ackermann-Alexeeff (2008–2009); Nathaniel Anozie (ADA, 2008); Raja Ahmad (2008–2009); Georg Goerg (ADA, 2009–2010)

THESIS COMMITTEES: Peiyi “Judy” Xi; Libo Xie; Sotirios Damouras; Jason Galyardt; Daniel Heinz; Ian McCulloh; Erich Huang; Di Liu; April Galyardt; Zhanwu Liu; Tracy Sweet

THESIS SUPERVISOR: Linqiao Zhao (with Mark Schervish; defended, 2010); Justin Gross (with Stephen Fienberg and David Krackhardt; defended, 2009); Daniel McDonald (with Mark Schervish); Georg Goerg (with Larry Wasserman).

Talks and Posters at Conferences

- Invited discussant, “Stability and the Generic Economic Model” workshop, Institute for New Economic Thinking, New York, 4 November 2011
- Invited discussant, “Sifting Fact from Fiction: The Role of Social Media in Conflict” workshop, United States Institute of Peace, Washington, D.C., 16 September 2011
- “Homophily, Contagion, Confounding: Pick Any Three”, at “Statistical Inference for Complex Networks” workshop, Santa Fe Institute, 4 December 2008; “Methodology for Empirical Research on Social Interactions, Social Networks and Health II” workshop, Institute for Quantitative Social Science, Harvard University, 13–14 November 2009; “Analyzing Networks and Learning with Graphs”, NIPS Workshop, Whistler, British Columbia, 11 December 2009; “Complex Networks” workshop, Statistical and Applied Mathematical Sciences Institute, Research Triangle, North Carolina, 29–30 August 2010; 2011 Atlantic Causal Inference Conference, University of Michigan, Ann Arbor, 19–20 May 2011

- “Bayesian Convergence under Dependence and Mis-Specification”, at “Information Theory and Applications” conference, UC San Diego, La Jolla, California, 10 February 2011
- Invited discussant, “Blogs and Bullets: Social Media and the Struggle for Political Change” workshop, Center on Democracy, Development, and Rule of Law, Stanford University, Stanford, California, 24 February 2011
- “Markovian (and Conceivably Causal) Representations of Stochastic Processes”, at Uncertainty in Artificial Intelligence 2010, Catalina Island, California, 9–11 July 2010; “Complexity and Statistics” workshop, Royal Statistical Society, London, 22 October 2010
- “Bayesian Learning, Relative Entropy, and Evolutionary Dynamics”, at 48th annual Allerton Conference on Communication, Control, and Computing, Monticello, Illinois, 30 September–1 October 2010
- “When Your Friend Joey Jumps Off a Bridge, Why Do You Jump Too?”, Sci-Foo 2010, Google, Mountainview, California, 30 July–1 August 2010
- Invited discussant, “Celebration of John Holland”, University of Michigan, 30 September 2009
- Invited discussant, “Estimating Effects and Correlations in Neuroimaging Data” workshop, Columbia University, 15 July 2009
- Invited discussant, Formal Epistemology Workshop 2009, 18–21 June 2009, Pittsburgh
- “Selecting and Evaluating Stochastic Models”, at “Statistical Inference for Complex Networks” workshop, Santa Fe Institute, 5 December 2008
- “Laplace’s Method in Neural Decoding”, poster at COSYNE08 (Computational and Systems Neuroscience 2008), Salt Lake City, 28 February–2 March 2008, with Shinsuke Koyama, Lucia Castellanos Pérez-Bolde, and Robert E. Kass
- “The Computational Structure of Spike Trains”, poster at COSYNE08, with Robert Haslinger and Kristina Lisa Klinkner
- “Why Oh Why Can’t We Have a Better Econophysics?”, at “Is There a Physics of Society?” workshop, Santa Fe Institute, 10–12 January 2008
- “Beyond Scaling: Quantitative Complexity Measures”, at “Complexity 2007” conference, University of Cambridge, 13–17 August 2007
- “Reconstructing Stochastic State Spaces from Discrete Time Series”, at “Statistical Methods for Modeling Dynamical Systems” workshop, Montreal, 9–13 July 2007

- “Emergence and the Complexity of Prediction”, at the Philosophy of Science 2006 conference, Vancouver, 2–5 November 2006
- “Optimal Nonlinear Prediction and Self-Organization”, at 2nd “Emergent Organization in Complex Biomolecular Systems” (EMBIO) meeting, Vienna, 22 and 23 May 2006
- “Measuring Shared Information and Coordinated Activity in Stochastic Networks”, at “New Pathways in Complex Systems”, Santa Fe Institute, 26–30 July 2005
- “Emergence, Levels of Description, and the Complexity of Prediction”, at CSIRO workshop “Does Anything Emerge?”, Melbourne, 12–14 May 2005
- “Detecting Information Sharing and Coordination in Network Dynamics”, at SFI workshop on “Robustness in Multiple Overlapping Networks”, 19–26 April 2005
- “Symbolic Dynamics, Coarse-Graining, and Levels of Description in Statistical Physics and Cognitive Science”, at “Symbol Grounding: Dynamical Systems Approaches to Language”, Potsdam, 14–17 March 2005
- “Quantifying Self-Organization and Coherent Structures with Statistical Complexity”, at “Nonlinearity, Stochasticity, Scaling, and Self-Organization in Space Plasmas” at the 2004 American Geophysical Union Fall Meeting, San Francisco, 14 December 2004
- “Blind Construction of Optimal Nonlinear Recursive Predictors for Discrete Sequences”, at “Twentieth Conference on Uncertainty in Artificial Intelligence” (UAI 2004), Banff, 9–11 July 2004
- “Social Science and Complex Systems: A View from Ann Arbor” at “Exsistence Thematic Institute on Complex Systems”, École Normale Supérieure de Lyon, 30 June 2003
- “Predicting Random Fields on Networks” at “Discrete Models for Complex Systems”, ENS-Lyon, 16–19 June 2003
- “Model Averaging, Diversity and Evolutionary Dynamics” at “Science et Gastronomie 2003”, ENS-Lyon, 9–13 June 2003
- “Quantifying Self-Organization in Cyclic Cellular Automata” at “Fluctuations and Noise 2003”, Santa Fe, 1–4 June 2003
- Invited discussant, “Interdisciplinary Work in Progress” conference, Stanford Center for the Study of the Novel, Palo Alto, 4 May 2002
- “Computational Mechanics and Pattern Discovery”, at the SFI/Max Planck Institute for Mathematics in the Sciences Joint Workshop on “Complexity Science in Eastern Europe/Complexity: Unifying Themes for the Sciences and New Frontiers for Mathematics”, Leipzig, 14–18 May 2001

Seminars and Other Talks

- “Projective Structure and Parametric Inference in Exponential Families of Networks”, Probability and Statistics Seminar, Boston University, 22 September 2011; Columbia University Applied Math, 3 November 2011
- “Homophily, Contagion, Confounding: Pick Any Three”, Information Sciences Institute, USC, Marina Del Rey, California, 7 July 2010; Yahoo! Research, New York, 18 October 2010; Complex Adaptive Behavior and Dynamics colloquium, Oxford University, 25 October 2010; Center for the Study of Complex Systems colloquium, University of Michigan, Ann Arbor, 7 December 2010; iLab Network Science Seminar, Carnegie Mellon University, 13 December 2010; Center for Complex Networks Research, Northeastern University, 12 May 2011
- “Markovian Representations of Stochastic Processes”, machine learning seminar, Purdue University, 14 April 2011
- “When Bayesians Can’t Handle the Truth”, Statistics Department, Bristol University, Bristol, UK, 29 October 2010; Statistics Department, Columbia University, New York, 20 October 2010; statistics/economics/philosophy joint seminar, Virginia Tech, 18 March 2010; Statistics Department, Harvard University, 4 April 2011; Statistics Department, Purdue University, 15 April 2011
- “Praxis and Ideology in Bayesian Statistics”, Philosophy Department, Carnegie Mellon University, 20 January 2011
- “Complexity and Prediction in Neural Spike Trains”, Applied Dynamics seminar, University of Maryland-College Park, 20 October 2011; Complex Systems Centre, Bristol University, 26 October 2010; Applied Mathematics Department, Columbia University, 19 October 2010
- “So, You Think You Have a Power Law”, New York Machine Learning Meetup, 18 October 2010
- “Identifying Coherent Structures from Data”, Chalmers University, Göteborg, Sweden, 27 November 2008
- “Statistical Tools for Complex Systems”, seminar, UC San Diego/ UC Irvine/ UCLA, 16 May 2008
- “Discovering Functional Communities in Dynamical Networks”, Center for Statistics and the Social Sciences, University of Washington-Seattle, 8 November 2006; computer science seminar, University of Maryland - College Park, 17 April 2008
- “Reconstructing State Spaces from Discrete Time Series”, Applied Mathematics Department, Columbia University, 2 October 2007; statistics seminar, Cornell University, 12 March 2008

- “Quantifying Self-Organization and Coherent Structure”, seminar, Physics Department, University at Albany, Albany, New York, 5 October 2007
- “Self-Organization and Coherent Structures”, seminar, Complexity Colloquium, University of North Carolina-Chapel Hill, 22 February 2006
- “Automatic Filters for the Detection of Coherent Structure in Spatiotemporal Systems”, seminar, Center for Automated Learning and Discovery, Carnegie Mellon University, 29 November 2005
- “Coarse-graining, Symbolic Dynamics and Collective Coordinates: How Physicists Deal with Large, Complex Systems, and Why Cognitive Scientists Might Care”, colloquium, Institute for Research in Cognitive Science, University of Pennsylvania, Philadelphia, 1 April 2005
- “Automatic Identification of Coherent Structures in Cellular Automata”, seminar, Max Planck Institute for Mathematics in the Sciences, Leipzig, 18 March 2005
- “Quantifying Self-Organization and Coherent Structures with Statistical Complexity”, nonlinear dynamics and complex systems seminar, Physics Department, University of Illinois, Urbana-Champaign, 10 February 2005
- “Reconstructing Predictive Hidden-State Models from Time Series”, seminar, Statistics Department, Carnegie Mellon University, Pittsburgh, 20 December 2004
- “Predicting Random Fields on Networks”, seminar, Computer Science Department, University of California-Irvine, 10 December 2004
- “Building Predictive Hidden-State Models from Time Series”, special lecture, Department of Computing Science, University of Alberta, 16 November 2004
- “Shared Information and Coordinated Activity in Distributed Systems”, Socio-Technical Infrastructure for Electronic Transactions seminar, School of Information, University of Michigan-Ann Arbor, 25 March 2004
- “Discovering Hidden Markov Models from Time Series”, seminar, Applied Research Laboratory, Pennsylvania State University, 16 July 2003
- “Building Predictors from Time Series, with an Application to Networks”, seminar, Center for the Study of Complex Systems, University of Michigan-Ann Arbor, 12 September 2002
- “Optimal Nonlinear Prediction and Filtering: A Thousand Household Uses”, lecture, SFI Computational Economics Summer School, Santa Fe, July 2002
- “Causal Synchrony”, presentation, DARPA TASK Program Meeting, Washington, D.C., 9 January 2002

- “Pattern Discovery Techniques for Social Science”, lecture, SFI Computational Economics Summer School, Santa Fe, 20 July 2001
- “Pattern Discovery in Networks”, presentation, 18 July 2001, Air Force Office of Scientific Research workshop “Infospherics: Science for Building Large-scale Global Information Systems”, George Mason University, Fairfax, Virginia, 17–19 July 2001
- “Spatiotemporal Emergent Structures from Causal Architecture”, seminar, Center for the Study of Complex Systems, University of Michigan-Ann Arbor, 22 March 2001
- “ ϵ -Transducers: Computational Mechanics of History-Dependent Transduction”, presentation at the SFI/Chinese Academy of Sciences (PRC) Working Group Meeting, Santa Fe, 15 August 2000
- “Computational Mechanics”, seminar, Center for the Study of Complex Systems, University of Michigan-Ann Arbor, 16 December 1999
- “Unique Optimal Predictors for Stochastic Processes”, UW-Madison Probability Seminar, 4 March 1999
- “You Call This Physics?”, Graduate Student Mini-Colloquium, Physics Department, UW-Madison, 23 February 1999
- “Two Lectures on Computational Mechanics”, in conjunction with the SFI Complex Systems Summer School, 18–19 June 1998
- “Uncovering Structure and Understanding How Nature Computes”, University of Wisconsin-Madison Chaos and Complex Systems Seminar, 16 September 1997
- “Digital Boiling, and Other Exciting Things”, UW-Madison C&CS Seminar, 29 April 1997
- “Is the Primordial Soup Done Yet? Quantifying Self-Organization, Especially in Cellular Automata”, UW-Madison C&CS Seminar, 30 April 1996. Online at <http://bactra.org/Self-organization/soup-done/>

Professional Activities

Associate editor: *Annals of Applied Statistics* (2008–).

Editorial board: *Structure and Dynamics: e-Journal of Anthropological and Related Sciences* (2005–).

Reviewer for *Advances in Complex Systems*; *Annals of Applied Statistics*; *Artificial Life*; *Behavioral & Brain Sciences*; *Biosystems*; *British Journal for the Philosophy of Science*; Cambridge University Press; *Chaos*; *Complexity*; *The Computer Journal*; CRC Press; *Econometrica*; *Entropy*; *European Physical Journal B*; *Europhysics Letters*; *Fluctuations and Noise Letters*; *Foundations of Physics*; *IEEE International Symposium on*

Information Theory; *IEEE Transactions on Information Theory*; *IEEE Transactions on Neural Networks*; *IEEE Transactions on Signal Processing*; *IEEE Transactions on Systems, Man, and Cybernetics A*; *Inverse Problems*; International Colloquium on Automata, Languages and Programming; International Conference on Machine Learning; International Joint Conference on Neural Networks; *International Journal of Theoretical and Applied Finance*; International Parallel and Distributed Processing Symposium; *Journal of Cellular Automata*; *Journal of Computational Neuroscience*; *Journal of Physics A*; *Journal of Statistical Mechanics*; *Journal of Statistical Physics*; *Journal of Statistical Planning and Inference*; *Journal of Theoretical Biology*; *Journal of the Royal Society Interface*; *Machine Learning*; *Mathematical Reviews*; MIT Press; *Nature*; *Neural Computation*; Oxford University Press; Perseus Books, Advanced Books Program; *Philosophy of Science*; *Physica A*; *Physica D*; *Physical Review A*; *Physical Review E*; *Physical Review Letters*; *Physics Letters A*; *PLoS Computational Biology*; *PLoS ONE*; Princeton University Press; *Proceedings of the National Academy of Sciences (USA)*; *Proceedings of the Royal Society (London) A*; *Science*; *Sociological Methods and Research*; *Statistics in Medicine*; University of Chicago Press; John Wiley and Sons; World Scientific Publishing.

Outstanding Referee, American Physical Society, 2011

Conference/workshop program committees: Noise in Complex Systems and Stochastic Dynamics (2003–2005); Alife X (2006) main conference and workshop on Evolution of Complexity; European Conference on Complex Systems 2006; workshop on Statistical Network Analysis at 23rd International Conference on Machine Learning (ICML 2006); European Conference on Artificial Life (2007, 2011); AAAI Spring Symposium on Social Information Processing (2008); Statistical Methods for the Analysis of Network Data in Practice (2009); AAAI International Conference on Weblogs and Social Media (2010, 2011); AISTATS (2011–); European Conference on Artificial Life (2011); WWW (2011); International Conference on Social Informatics (SocInfo 2011)

Union activities: Member of the Teaching Assistants Association at UW-Madison, 1994–2001; Natural Sciences area representative, 1995–1996; Physics Department steward, 1996–1997.

Grant review: Expert evaluator for the “Future and Emerging Technologies” program of the European Commission’s research directorate, 2001–. Referee for the Technology Foundation STW (Dutch national technology research agency), 2003; for the National Environment Research Council (UK), 2004; for the Civilian Research and Development Foundation (US), 2004; for the National Science Foundation (US), 2007–; for the Institute for New Economic Thinking, 2010–.

University service: Statistics department senator, Carnegie Mellon University faculty organization, 2011–2012.

Workshops and Journal Special Issues Organized

- *Theory and Applications of Complex Networks*, IMS panel at the 2006 Joint Statistical Meeting. Seattle, 7 August 2006.
- *Order out of disorder: the role of noise in creative processes*, special issue of *Fluc-*

tuation and Noise Letters (vol. 2, no. 4, December 2002), editor with Derek Abbott and P. C. W. Davies.

- *Collective Cognition: Mathematical Foundations of Distributed Intelligence*, co-chair with James P. Crutchfield, Kagan Tumer and David H. Wolpert. Santa Fe, 22–26 January 2002.
Website: <http://www.santafe.edu/~dynlearn/colcog>.

Magazine Articles

- (with H. Farrell), “Nudge No More”, *New Scientist* **2837** (9 November 2011)
- “Connecting the Dots”, *American Scientist* **99** (2011): 335 (review of D. Easley and J. Kleinberg, *Networks, Crowds, and Markets*)
- “Honor Among Thieves”, *American Scientist* **99** (2011): 87 (review of K. Sigmund, *The Calculus of Selfishness*)
- “The Bootstrap”, *American Scientist* **98** (2010): 186–190
- “Ready or Not”, *American Scientist* **98** (2010): 160 (review of S. Hough, *Predicting the Unpredictable: The Tumultuous Science of Earthquake Prediction*)
- “Twilight of the Efficient Markets”, *American Scientist* **97** (2009): 504 (review of J. Fox, *The Myth of the Rational Market*)
- “The Domestication of the Savage Mind”, *American Scientist* **97** (2009): 244 (review of J. R. Flynn, *What Is Intelligence?*)
- “Obstacles and Tricks”, *American Scientist* **97** (2009): 160 (review of T. Tao, *Structure and Randomness*)
- “The Logic of Diversity: The Complexity of a Controversial Concept”, *Santa Fe Institute Bulletin*, **20:1** (2005): 34–38
- “The world is our laboratory: Myron Scholes and the history of finance”, *Quantitative Finance*, **3:2** (2003): C20–C21.
- “Growth, Form, Function, and Crashes”, *SFI Bulletin* **15:2** (2000): 6–11.
- “Modeling Markets”, *SFI Bulletin*, **15:1** (2000): 10–15.
- “*Homo reciprocans*: Political Economy and Cultural Evolution”, *SFI Bulletin*, **14:2** (1999): 16–20.
- “What Can Emergence Tell Us About Today’s Eastern Europe?” *SFI Bulletin*, **14:1** (1999): 8–10.
- “Scientific Models: Claiming and Validating”, *SFI Bulletin*, **13:2** (1998): 8–12.

Book Reviews

I have written over 130 book reviews, reviewing works on physics, complexity, mathematics, economics, cognition, statistics, philosophy of science, machine learning, evolutionary biology and literary theory. A complete list of my reviews, and their full text, are online at <http://bactra.org/reviews/>. Some of them have appeared in *American Scientist*, the *Bulletin of the London Mathematical Society*, *Physics Today*, and *Quantitative Finance*.

Weblog

THREE-TOED SLOTH since 2003, <http://bactra.org/weblog/>, ranked one of the top fifty science weblogs by *Nature* (442 [2006]: 9); and NOTEBOOKS, <http://bactra.org/notebooks/>, since 1994.