Joshua Garland
Omidyar Fellow
Santa Fe Institute
Santa Fe, NM 87501
email: joshua@santafe.edu

Research Interests

Complex systems; nonlinear dynamics and chaos; nonlinear time-series analysis and forecasting; information-theoretic measures on real-valued time series; information-theoretic measures for dynamic network analysis.

Academic Appointments

Omidyar Fellow Aug. 2016-Present
Santa Fe Institute, Santa Fe, New Mexico

Visiting Scholar Spring 2015 and Fall 2017
Max-Planck-Institut Für Physik Komplexer Systemer, Dresden, Germany

Education

Degrees Awarded

Ph.D. Computer Science
University of Colorado at Boulder May 2016
"Prediction in Projection: A new paradigm in delay-coordinate reconstruction"
Thesis research under Professor E. Bradley combining ideas from nonlinear dynamics, time- series analysis and information theory in order to construct a new reduced-order paradigm in delay-coordinate reconstruction based forecast models. Dissertation available at `arXiv:1805.07360`.

M.S. Applied Mathematics
University of Colorado at Boulder May 2011
"Prediction in Projection: Computer Performance Forecasting, A Dynamical Systems Approach"
Thesis research under Professors E. Bradley and J. Meiss on reduced-order forecast models of computer performance dynamics.

B.S. Mathematics with Highest Distinction
Colorado Mesa University May 2009
Thesis research under Professor M. Reitenbach regarding the unification and equivalence of algebraic, analytic, and topological representations of the p-adic number system.

B.S. Computer Science with Highest Distinction
Colorado Mesa University May 2009
Broad curriculum in computer science, with numerous research projects including "Optimizing Mandelbrot Generation Using Connectedness, Recursion and Assembly" and a capstone project with D. Warbritton of John Deere.

Professional Development

Quantopian Advanced Algorithmic Trading Workshop
Quantopian, New York, New York, Completed April 2017

Quantopian Introduction to Algorithmic Trading Workshop
Princeton, Princeton, New Jersey, Completed April 2017

Graduate Teacher Program Certificate in College Teaching
University of Colorado, Boulder, Colorado, Completed May 2016

Complex Systems Summer School
Santa Fe Institute, Santa Fe, New Mexico, June 2011

Graduate Teacher Program Seminar in Academic Management, Leadership, and Consultation
University of Colorado, Boulder, Colorado, May 2011

Graduate Teacher Program Fall Intensive
University of Colorado, Boulder, Colorado, August 2009

College Reading & Learning Association Master Tutor Certification
Colorado Mesa University, Grand Junction, Colorado, Completed May 2007

Publications

I. Journal Papers († represents joint first author)

- J. Garland†, T.R Jones†, M. Neuder, V. Morris, J.W.C. White and E. Bradley "Anomaly Detection in Paleoclimate Records Using Permutation Entropy," *Entropy* **20**(12):931 (2018).
- F. Pennekamp†, A. C. Iles†, J. Garland, U. Brose, G. Brennan, U Gaedke, U. Jacob, P. Kratina, B. Matthews, S. Munch, M. Novak, G. Palamara, B. Rall, B. Rosenbaum, A. Tabi, C. Ward, R. Williams, H. Ye, and O. Petchey "The intrinsic predictability of ecological time series and its potential to guide forecasting," In press at *Ecological Monographs*. doi:10.1002/ecm.1359 (2018).
- J.N. Pruitt, A.M. Berdahl, C. Riehl, N. Pinter-Wollman, H. V. Moeller, E. G. Pringle, L. M. Aplin, E. J. H. Robinson, J. Grilli, P. Yeh, V. M. Savage, M. H. Price, J. Garland, I. C. Gilby, G. N. Doering, E. Hobson "Social Tipping Points in Animal Societies," *Proceedings of the Royal Society B* **285**:20181282. doi:10.1098/rspb.2018.1282 (2018).
- J. Garland, A.M Berdahl, J. Sun and E. Bollt "The Anatomy of Leadership in Collective Behaviour," *CHAOS* **28**:075308 doi:10.1063/1.5024395 (2018). **Most Dowloaded Paper of 2018 for CHAOS.**
- S. Tao, S. F. Way, J. Garland, J. Chrispin, L. A. Ciuffo, M. A. Balouch, S. Nazarian, D. D. Spragg, J. E. Marine, R. D. Berger, H. Calkins and H. Ashikaga, "Ablation as Targeted Perturbation to Rewire Communication Network of Persistent Atrial Fibrillation ," *PLoS ONE*; **12**(7): e0179459. doi:10.1371/journal.pone.0179459 (2017).
- J. Garland, E. Bradley, J.D. Meiss, "Exploring the Topology of Dynamical Reconstructions," *Physica D* **334**: 49-59 doi:10.1016/j.physd.2016.03.006 (2016).
- J. Garland, R.G. James, and E. Bradley, "Leveraging information storage to select forecast-optimal parameters for delay-coordinate reconstructions," *Physical Review E* **93**:022221 doi: 10.1103/PhysRevE.93.022221 (2016).
- J. Garland, E. Bradley, "Prediction in Projection," *CHAOS* **25**:123108 doi:10.1063/1.4936242 (2015).
- D. Darmon, E. Omodei, J. Garland, "Followers Are Not Enough: A Multifaceted Approach to Community Detection in Online Social Networks," *PLoS ONE* **10**(8): e0134860. doi:10.1371/journal.pone.0134860 (2015).
- H. Ashikaga, J. Aguilar-Rodríguez; S. Gorsky, E. Lusczek, F.M.D. Marquitti, B. Thompson, D. Wu, J. Garland, "Modeling the Heart as a Communication System," *Journal of the Royal Society Interface* **12** (105). doi: 10.1098/rsif.2014.1201 (2015).

- E. Komendera, J. Garland, E. Bradley, D. Scheeres, "Efficiently Evaluating Reachable Sets in the Circular Restricted 3-Body Problem," *IEEE Transactions on Aerospace and Electronic Systems* **51** (1) 456-467 doi: 10.1109/TAES.2014.130781 (2015).
- J. Garland, R.G James, E. Bradley,"Model-Free Quantification of Time-Series Predictability," *Physical Review E* **90**:052910 doi: 10.1103/PhysRevE.90.052910 (2014).
- Z. Alexander, E. Bradley, J. Garland, J. Meiss, "Iterated Function System Models in Data Analysis: Detection and Separation," *CHAOS* **22**:023103 doi:10.1063/1.3701728 (2012).

II. Refereed Conference Papers

- J. Garland, T.R Jones, E. Bradley, R.G. James and J.W.C. White "A First Step Toward Quantifying the Climate's Information Production Over the Last 68,000 Years," *IDA-16 (Proceedings of the* 15^{th} *International Symposium on Intelligent Data Analysis)*, Springer Lecture Notes in Computer Science volume 9897. Stockholm, Sweden, October 2016 doi: 10.1007/978-3-319-46349-0_30.
- J. Garland, E. Bradley, "On the Importance of Nonlinear Modeling in Computer Performance Prediction," *IDA-13 (Proceedings of the* 12^{th} *International Symposium on Intelligent Data Analysis)*, Springer Lecture Notes in Computer Science volume 8207. London, England, October 2013. **IDA-13 Frontier Prize Recipient**.
- J. Garland, E. Bradley, "Predicting Computer Performance Dynamics," *IDA-11 (Proceedings of the* 10^{th} *International Symposium on Intelligent Data Analysis)*, Springer Lecture Notes in Computer Science volume 7014. Porto, Portugal, October 2011.

III. Refereed Abstracts

- H. Ashikaga, J. Chrispin, D. Wu and J. Garland, "Pulmonary Vein Isolation 'Rewires' Electrical Communications to Enhance Small-world Network Topology During Atrial Fibrillation," *Circulation* **132** (Suppl 3) A17426-A17426 (2015).

IV. Currently in Review

- J.N. Pruitt†, J. Garland†, H. Moeller, A. Berdahl, N. Pinter-Wollman, P. Yeh, V. Savage, K. Demes, A. Little, D. Fisher, M. Price, D. Feldman, E. J. H. Robinson, E. Hobson"Coupled Tipping Points in Socio-ecological Systems". Submitted to *Ecology* Jan 10, 2019.
- E. Hobson, V. Ferdinand, A. Kolchinsky, J. Garland "What are we missing about animal social complexity?" Submitted to *Animal Behavior* Dec 4, 2018.
- J. Garland, T.R Jones, E. Bradley, M. Neuder and J.W.C. White "Climate entropy production recorded in a deep antarctic ice core," Submitted to *PLoS One* June 20, 2018.

V. Other Publications

- J. Garland and E. Bradley, "Information Theory in Earth and Space Science," SIAM News, October 2018.
- A. Berdahl, U. Bhat, V. Ferdinand, J. Garland, K. Ghazi-Zahedi, J. Grana, J. A. Grochow, E. Hobson, Y. Kallus, C. P. Kempes, A. Kolchinsky, D. B. Larremore, E. Libby, E. A. Power, and B. D. Tracey, "On the records" `arXiv:1705.04353`, 2017.
- D. Darmon, E. Omodei, C. Flores, L. F. Seoane, K. Stadler, J. Wright, J. Garland and N. Barnett, "Detecting Communities Using Information Flow in Social Networks", 2013 SFI Complex Systems Summer School Proceedings (available at `goo.gl/WX77Gk`), 2013.
- D. Masad, E. Omodei, C. Strohecker, Y. Xu, J. Garland, M. Zhang and L. F. Seoane, "Unfolding History: Classification and Analysis of Written History as a Complex System", 2013 SFI Complex Systems Summer School Proceedings (available at `goo.gl/WX77Gk`), 2013.
- J. Garland, R. James, and E. Bradley, "Determinism, Complexity, and Predictability of Computer Performance" `arXiv:1305.5408`, 2013.

- J. Garland., "Rigorously Pursuing Chaos in Time Series Data: An Algebraic Topology Approach," in Projects in Chaotic Dynamics: Spring 2010, Technical Report CU-CS (Department of Computer Science) 1066-10, 2010.

VI. Media Coverage

- "Quantifying Effectiveness of Treatment for Irregular Heartbeat: A mathematical method to measure the effectiveness of treating Afib", John Hopkins Medicine News, July 17, 2017
- "Reading between the lines of ice core data" E&E News Climate Wire, December 12, 2016.
- "Predicting unpredictability: Information theory offers new way to read ice cores", SFI news, December 6, 2016. Story was then picked up by multiple news sources including Science Daily and Science Newsline
- "DS Web Student Feature–Joshua Garland" Dynamical Systems Web, November 4th, 2016. https://dsweb.siam.org/Students/Student-Feature/student-feature-joshua-garland-1
- "Approach That 'Digitizes' Crosstalk Among Heart Cells May Help Locate Epicenters of Dangerous Heart Rhythms" John Hopkins Medicine News, March 10, 2015. Story was then featured on front page of SciGuru Science News.

Patents

- H. Ashikaga, J. Garland and S. Way, "A Method to Guide Treatment of Heart Rhythm Disorders," U.S. Provisional Patent Application, priority date September 4, 2015.

Research Funding

- National Science Foundation EAGER #1807478 2017-2018
  PI: J. Garland $193K
  Topic: "Targeted resampling of deep polar ice cores using information theory"

- W.W. Smith Chartable Trust - Heart Research Program 2016
  PI: H. Ashikaga $100K/year
  Topic: "Manipulating Communication Networks of Human Atrial Fibrillation"
  Role: Co-Investigator (100% effort) and Co-Author

- National Science Foundation contract #CMMI-1162440 2012-2015
  PI: E. Bradley $366K plus $12K Research Experience for Undergraduates (REU) supplement
  Topic: "Reduced-Order Dynamical Models for Effective Power Management in Computer Systems"
  Role: Co-Investigator (100% effort) and Co-Author

Invited Presentations

- *K. Ghazi-Zahedi*, J. Garland, M. Galesic "How effective is counter-speech for countering cyberhate?," ODYSSEUS EU Meeting. Leipzig, Germany Nov. 15, 2018.
- *J. Garland* "Nonlinear Time Series Analysis," Scripps Institution of Oceanography Seminar Series. La Jolla, California. Oct. 25, 2018.
- *J. Garland* "Deconstructing the climate's information production over the last 128,000 years: a multi-scaled approach," Max-Planck-Institut Für Physik Komplexer Systemer Seminar Series for Climate Fluctuations and Non-equilibrium Statistical Mechanics: An Interdisciplinary Dialogue. Dresden, Germany. July 31, 2017.

- *J. Garland*, A. Berdahl, J. Sun and E. Bolt, "Inferring Influence and Leadership in Mobile Animal Groups," SIAM Conference on Applications of Dynamical Systems (DS17), Causation Inference and Information Flow in Dynamical systems: Theory and Application Minisymposium. Snowbird, Utah. May 24, 2017.
- *J. Garland*, "Climate Information Production Recorded in Water Isotopes from Deep Polar Ice Cores," University of New Mexico, Mechanical Engineering Department Colloquium. Albuquerque, New Mexico. March 10, 2016
- *J. Garland*, "A Nice Slice of Ice: Unravelling the Secrets of the Earth's Ancient Climate," Santa Fe Institute, Slice of Science Seminar. Santa Fe, New Mexico. December 13, 2016
- *J. Garland*, "A First Step Toward Quantifying the Climate's Information Production Over the Last 68,000 Years," Max-Planck-Institut Für Physik Komplexer Systemer, Nonlinear Time Series Analysis Seminar. Dresden, Germany. November 14, 2016.
- *J. Garland*, "Prediction in Projection," University of Colorado, Department of Applied Mathematics Dynamical Systems Seminar. Boulder, Colorado. September 17, 2015.
- *J. Garland*, "Prediction in Projection," Max-Planck-Institut Für Mathematik in den Naturwissenschaften, Institute Colloquium. Leipzig, Germany. April 29, 2015.
- *J. Garland*, "Prediction in Projection," Max-Planck-Institut Für Physik Komplexer Systemer, Nonlinear Time Series Analysis Seminar. Dresden, Germany. April 9, 2015.
- *J. Garland*, "Prediction in Projection," University of California Davis, Complexity Sciences Center Seminar. Davis, California. November 12, 2014.
- *H. Ashikaga* and J. Garland, "Information Theory of the Heart," University of Colorado, Department of Applied Mathematics Dynamical Systems Seminar. Boulder, Colorado. October 16, 2014.
- *J. Garland*, "Exploring Complexity: Mathematics *Beyond* Calculus," Colorado Mesa University 16^{th} Annual Math Extravaganza **Keynote Address**. Grand Junction, Colorado. February 13, 2014.
- *J. Garland*, "Complex Systems: A Glimpse Into a Scientific Revolution," Colorado Mesa University Mathematics, Statistics and Computer Science Department Colloquium. Grand Junction, Colorado. November 15, 2013.
- *J. Garland*, "Modeling Computer Dynamics: Can Complexity Overshadow Determinism?," Institut des Systémes Complexes de Paris Ile-de-France Colloquium. Paris, France. October 23, 2013.
- *J. Garland* and *J. Tsai*, "Grading Problems in STEM Disciplines," University of Colorado Graduate Teaching Program Fall Intensive. Boulder, Colorado. August 23, 2012.
- *J. Garland* and *E. Polizzi*, "The Fifth Rule, An Agent Based Model Approach: The Evolution of Cooperation with Extensions to Real Data," Rome, Italy. November 3, 2011.
- *J. Garland*, "Modeling and Predicting the Dynamics of Computer Performance," Universitat Autonoma de Barcelona Centre De Recerca Matematica Department Colloquium. Barcelona, Spain. November 2, 2011.
- *J. Garland*, "Modeling and Predicting the Dynamics of Computer Performance," University of Manchester Mathematics Department Colloquium. Manchester, England. October 27, 2011.
- *J. Garland*, "Grading Problems in STEM Disciplines," University of Colorado Graduate Teaching Program Fall Intensive. Boulder, Colorado. August 18, 2011.
- *J. Garland*, "Prediction in Projection: Computer Performance Forecasting, A Dynamical Systems Approach," Colorado Mesa University Mathematics, Statistics, and Computer Science Department Colloquium. Grand Junction, Colorado. March 25, 2011.

Contributed Presentations

- J. Garland, T.R Jones, E. Bradley, M. Neuder and J.W.C. White "Climate Entropy Production Recorded in a Deep Antarctic Ice Core," Conference on Complex Systems 2017 (CCS17). Cancun, Mexico. September 19, 2017.
- *J. Garland*, "Climate Information Production Recorded in Water Isotopes from Deep Polar Ice Cores," Max-Planck-Institut Für Physik Komplexer Systemer Workshop on Climate Fluctuations and Non-equilibrium Statistical Mechanics: An Interdisciplinary Dialogue. Dresden, Germany. July 20, 2017.
- J. Garland, T.R Jones, *E. Bradley*, R.G. James and J.W.C. White, "A First Step Toward Quantifying the Climate's Information Production Over the Last 68,000 Years," SIAM Conference on Applications of Dynamical Systems (DS17). Snowbird, Utah. May 24, 2017.
- J. Garland, T.R Jones, E. Bradley, R.G. James and J.W.C. White "A First Step Toward Quantifying the Climate's Information Production Over the Last 68,000 Years," AGU Fall Meeting. San Francisco , California, December 2016.
- J. Garland, T.R Jones, E. Bradley, R.G. James and J.W.C. White "A First Step Toward Quantifying the Climate's Information Production Over the Last 68,000 Years," The 15^{th} International Symposium on Intelligent Data Analysis (IDA16). Stockholm, Sweden, October 2016.
- *J. Garland*, and E. Bradley, "Prediction in Projection," Conference on Complex Systems 2015 (CCS'15). Tempe, Arizona. Oct. 2, 2015.
- E. Bradley, J.D. Meiss, *J. Garland* and N. Sanderson, "Computational Topology Techniques for Regime-Shift Detection in Dynamical Systems," Conference on Complex Systems 2015 (CCS'15). Tempe, Arizona. Sept. 29, 2015.
- *H. Ashikaga*, J. Chrispin, S. Way and J. Garland, "Exploring Cardiac Arrhythmia as a Communication Failure in Cardiomyocyte Networks," Conference on Complex Systems 2015 (CCS'15). Tempe, Arizona. Sept. 28, 2015.
- *H. Ashikaga*, J. Chrispin, D. Wu and J. Garland, "Exploring Cardiac Arrhythmia as a Communication Failure in Cardiomyocyte Networks," Biological Cell Information Processing Workshop at International Conference on Unconventional and Natural Computation (UCNC'15). Auckland, New Zealand. Sept. 4, 2015.
- *E. Bradley*, J.D. Meiss, J. Garland and N. Sanderson, "Computational Topology Techniques for Characterizing Time Series Data," SIAM Conference on Applications of Dynamical Systems (DS15). Snowbird, Utah. May 18, 2015.
- *J. Garland* and E. Bradley, "Prediction in Projection," SIAM Conference on Applications of Dynamical Systems (DS15). Snowbird, Utah. May 17, 2015.
- D. Darmon, *E. Omodei*, and J. Garland, "Question-Oriented Community Detection in Online Social Networks," European Conference on Complex Systems (ECCS'14). Lucca, Italy. September 23, 2014.
- D. Darmon, *E. Omodei*, J. Garland, C. Flores, L. Seoane, K. Stadler, J. Wright, and N. Barnett, "Detecting Communities Using Information Flow in Social Networks," YRNCS Satellite, European Conference on Complex Systems (ECCS'13). Barcelona, Spain. September 15, 2013.
- *J. Garland* and E. Bradley, "Modeling Computer Dynamics: Can Complexity Overshadow Determinism?," SIAM Conference on Applications of Dynamical Systems (DS13). Snowbird, Utah. May 21, 2013.
- *E. Bradley* and J. Garland, "Analysis & Prediction of Computer Performance Dynamics," XII Experimental Chaos and Complexity Conference. Ann Arbor, Michigan. May 18, 2012.

- *J. Garland* and E. Bradley, "Prediction of Computer Dynamics," SIAM Conference on Applications of Dynamical Systems (DS11). Snowbird, Utah. May 23, 2011.
- *J. Garland*, "Prediction in Projection: Computer Performance Forecasting, A Dynamical Systems Approach," SIAM Front Range Student Conference. Denver, Colorado. March 5, 2011.
- *J. Garland* and D. Warbritton, "Development of an Algorithm to Compute and Display the Mandelbrot Set with Maximum Efficiency," Colorado Mesa University Student Scholars Symposium. Grand Junction, Colorado. April 27, 2009.
- *J. Garland*, "p-adic Numbers," MAA MathFest 2008. Madison, Wisconsin. July 31, 2008.
- *J. Garland*, "p-adic Numbers," Colorado Mesa University Student Scholars Symposium. Grand Junction, Colorado. April 28, 2008. **Best Talk Recipient.**
- *J. Garland*, "p-adic Numbers," Colorado Mesa University Mathematics, Statistics and Computer Science Department Colloquium. Grand Junction, Colorado. April 25, 2008.

Contributed Posters (not mentioned above)

- *J.B. Kirby*, J. Garland, M. Babkes Stellino, and R.J. Brustad, "In brotherhood we trust: A social media case study". Association for Applied Sport Psychology 33^{rd} Annual Conference. Toronto, Canada. October 2, 2018.
- *E. Bradley*, J. Garland, M. Neuder, T.R Jones, and J.W.C. White "Quantifying the Climate's Information Production Over the Last 68,000 Years," Packard Fellowships for Science and Engineering 30^{th} Anniversary Reunion Poster Session. San Diego, California. September 6, 2018.
- *H. Ashikaga*, S. Way, J. Chrispin, D. Wu and J. Garland, "Pulmonary Vein Isolation 'Rewires' Electrical Communications to Enhance Small-World Network Topology During Atrial Fibrillation," American Heart Association Scientific Sessions. Orlando, Florida. November 8, 2015.
- *J. Garland* and E. Bradley, "On the Importance of Nonlinear Modeling in Computer Performance Prediction," Advances in Intelligent Data Analysis XII Symposium. London, England. October 15, 2013.
- *J. Garland* and E. Bradley, "Modeling Computer Dynamics: Can Complexity Overshadow Determinism?," XXXII Dynamics Days US 2013. Denver, Colorado. January 5, 2013.
- *J. Garland* and E. Bradley, "Predicting Computer Performance Dynamics," University of Colorado 80^{th} Birthday Symposium for Andrzej Ehrenfeucht. Boulder, Colorado. September 14, 2012.
- *J. Garland* and E. Bradley, "Predicting Computer Performance Dynamics," Advances in Intelligent Data Analysis X Symposium. Porto, Portugal. October 31, 2011.

Research Mentoring Experience

Complex Systems Summer School Project Coordinator Summer 2014-2016
In this capacity I have been the primary advisor for approximately 150 graduate and postdoctoral students in over 60 graduate/postdoctoral level research projects, many of which have gone on to publish in top-tier journals, in all areas of complex systems science. This included helping with research question formulation, collaboration efforts and network development, research path guidance, suggestions of applicable computational tools and putting the groups in contact with senior researchers for collaboration.
Santa Fe Institute

Undergraduates at the Santa Fe Institute for whom I was the primary research advisor.

- Michael Neuder: Automated UAV Animal Tracking with Deep Neural Nets *[5/18-Present]*
- Benjamin Anker: Prejudice Detection through Part of Speech Drift*[5/18-Present]*

High School Interns at the Santa Fe Institute for whom I was the primary research advisor.

- Patrick Mauboussin: Intro to Complexity and Data Science *[Summer 2018]*
- Nick Dow: Intro to Complexity and Data Science *[Summer 2018]*

University of Colorado
Undergraduates at the University of Colorado at Boulder for whom I was the primary research mentor.

- Michael Neuder: Information Theory of the Climate
  Departments of Applied Mathematics *[6/17-Present]*
- Denis Kazakov: Time Series Analysis and Forecasting Strategies
  Departments of Computer Science and Applied Mathematics *[9/13-5/14]*
- Aaron Sheppard: Linear Time Series Analysis and Forecasting Strategies
  Department of Mechanical Engineering *[10/11-5/12]*
- Eric Horacek: Validating Architectural Simulators Using Nonlinear Dynamics Techniques
  Department of Computer Science *[9/10-5/12]*
- Connor Janowiak: Validating Architectural Simulators Using Nonlinear Dynamics Techniques
  Department of Computer Science *[9/10-5/12]*

Professional Service

Conference, Workshop and Symposium Organizer

Santa Fe Institute Slice of Science Seminar 2017-Present

Mathematical Association of America Workshop on Dynamical Systems: *Grappling with Chaos: How Simplicity Gives Rise to Complexity* Spring 2016
An interactive workshop where participants were exposed to introductory concepts in the field of nonlinear dynamical systems such as maps, bifurcations and chaos. Many of the examples used in this workshop were intended to be easily extended for use in the classroom, with the direct intent of sparking new and interesting undergraduate research projects.

Dynamical Systems Symposium at the Joint Intermountain and Rocky Mountain MAA Section Meeting Spring 2016

Committees

Complex Systems Summer School Applicant Review Committee 2013-Present
Reviewed and ranked a selection of applicants for the Complex Systems Summer School
Omidyar Fellow Selection committee 2017-Present
Reviewed and ranked a selection of applicants for the Santa Fe Institute Omidyar Fellowship, and participated in the full selection process.
Postdoctoral Representative to the Science Board 2017-Present
Liaison between the Santa Fe Institute postdoctoral fellows and the science board.

Postdoctoral Representative to the Faculty 2017-Present
Liaison between the Santa Fe Institute postdoctoral fellows and the faculty.

Peer review
Journal Review Chaos, Entropy, Physica D, Science Advances

Other

President 2008
Alpha Chi National Honor Society, Colorado Gamma Chapter

President AY 06/07
Kappa Mu Epsilon National Mathematics Honor Society, Colorado Delta Chapter

President AY 05/06
Colorado Mesa University Math Club

Math Extravaganza Station Leader
An event aimed at getting high school students excited about the opportunities in pursuing a career in Mathematics. Stations I helped organize and lead included:

"Pure Geometry: The Pentagon"	2008
"Elementary Proofs of the Pythagorean Theorem and Pythagoreanism"	2007
"Non-Euclidian Geometries"	2006
"Robotics"	2005

Scholarships, Honors and Awards

Ralph J. Slutz Student Excellence Award AY 15/16
Department of Computer Science, University of Colorado, Boulder, Colorado

Outstanding Researcher Award AY 14/15
Department of Computer Science, University of Colorado, Boulder, Colorado

Intelligent Data Analysis 2013 Frontier Prize 2013
"The IDA Frontier Prize will be awarded to the most novel and visionary contribution."
http://sites.brunel.ac.uk/ida2013/frontier-prize

National Science Foundation Graduate Research Fellowship Honorable Mention 2011
National Science Foundation

Best Should Teach Silver Medal AY 10/11
Graduate Teaching Program, University of Colorado, Boulder, Colorado

Teaching Experience

Instructor

Santa Fe Institute

Complex Systems Summer School: Nonlinear Dynamics and Chaos Module Summer 2016,2017

Responsibilities: Developed from scratch two interactive labs/worksheets: introducing the students to the concepts of maps and flows, and the tools of nonlinear time-series analysis. Prepared and gave two lectures to accompany the labs and the associated material and was available to discuss how the topics of the labs applied to student's individual research.

Workshop Organizer

Mathematical Association of America

Nonlinear Dynamics Workshop Spring 2015

An interactive workshop where participants were exposed to introductory concepts in the field of nonlinear dynamical systems such as maps, bifurcations and chaos. Many of the examples used in this workshop were intended to be easily extended for use in the classroom, with the direct intent of sparking new and interesting undergraduate research projects.

Teaching Assistant

Santa Fe Institute Complexity Explorer

Nonlinear Dynamics: Mathematical and Computational Approaches Fall 2014

A MOOC (massive online open course), on nonlinear dynamics and chaos.

Responsibilities: Helped develop homework, quizzes and exams for each unit. Created homework and quiz solution (tutorial) videos. Prepared and delivered video lectures on nonlinear time series analysis. Helped administer the forum and course email by answering student questions and facilitating forum discussions.

Lab Instructor

Santa Fe Institute

Complex Systems Summer School: Nonlinear Dynamics and Chaos Module Summer 2011-2015

Responsibilities: Developed from scratch two labs: introducing the students to the concepts of maps and flows, and the tools of nonlinear time-series analysis. Prepared and gave two lectures to accompany the labs and the associated material and was available to discuss how the topics of the labs applied to student's individual research.

Instructor

University of Colorado

Teaching Excellence Seminar Fall 2010

A graduate seminar designed to teach new graduate students how to be successful as teaching assistants.

Responsibilities: Prepared and gave weekly lectures, provided office hours for mentoring first year teaching assistants, provided video tape consultations to constructively evaluate new teaching assistants' performance.

Recitation Instructor

University of Colorado

Differential Equations with Linear Algebra Spring 2010, Fall 2010

Responsibilities: Wrote a syllabus, prepared and gave weekly recitation lectures, held open office hours as well as individual appointments to assist students, prepared and delivered guided exam reviews, wrote and gave weekly quizzes, proctored exams, assisted students with quarterly labs, graded daily homework assignments, weekly quizzes, labs and exams.

Calculus II Fall 2009
Responsibilities: Wrote a syllabus, prepared and gave weekly recitation lectures, provided open office hours as well as individual appointments to assist students, prepared and delivered guided exam reviews, wrote and gave weekly quizzes, proctored exams, graded daily homework assignments, weekly quizzes, and exams.

Colorado Mesa University
Foundations of Computer Science Fall 2006, 2008
Responsibilities: Assisted with homework and conceptual questions during recitations, prepared example problems to go through with the students, assisted with code concepts and debugging.

Probability and Statistics Spring 2008
Responsibilities: Assisted with homework and conceptual questions during recitations, prepared example problems to go through with the students, prepared and delivered guided exam reviews.

Data Structures Spring 2007
Responsibilities: Assisted with homework and conceptual questions during recitations, prepared example problems to go through with the students, assisted with code concepts and debugging.

Grading Assistant
Colorado Mesa University
Beginning Programming: Visual Basic Spring 2005

Consulting

Complexity Analytics LLC **Founder and CEO**
Founded August 14, 2015
A consulting firm that brings a complex systems approach to data analytics.

Employment

Consultant
Chora Capital LLC July 2015-Present

Research Assistant
University of Colorado
Funded by National Science Foundation contract #CMMI-1162440 Spring 2013-Summer 2016
Topic: "Reduced-Order Dynamical Models for Effective Power Management in Computer Systems"
PI: E. Bradley, Dept. of Computer Science (co-authored this proposal)

Funded by Innovative Seed Grant Program Fall 2012, Summer 2013
Topic: "Applications of Artificial Intelligence Techniques to the Computation of Reachability Sets."
PIs: E. Bradley, Dept. of Computer Science & D. Scheeres Dept. of Aerospace Engineering Science

Funded by National Science Foundation contract #SMA-0720692 Sum. 2010, Spr. 2011- Spr. 2012
Topic: "Validating Architectural Simulators Using Non-Linear Dynamics Techniques"
PIs: E. Bradley, Dept. of Computer Science & A. Diwan, Google Research

Teaching Assistant
Santa Fe Institute
Complexity Explorer — Aug. 2014 - Dec. 2014

Lead Graduate Teaching Assistant
University of Colorado
Department of Applied Mathematics — May 2010 - May 2011
Job appointment based on selection as top graduate teaching assistant for the 2009 academic year. Responsibilities: Mentored and provided video consultations and feedback for first-year teaching assistants, taught a graduate-level teaching seminar and ran workshops on grading in STEM disciplines.

Teaching Assistant
University of Colorado
Department of Applied Mathematics — Aug. 2009 - May 2010

Teaching Assistant
Colorado Mesa University
Department of Computer Science, Mathematics, and Statistics — Jan. 2005 - May 2008

Tutor
Colorado Mesa University
Tutorial Learning Center — Oct. 2004 - May 2009

- *Received CRLA Master Tutor Certification in 2007*
- *Over 900 hours of individual tutoring*

Student Orientation Leader
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References

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