Joshua Garland

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Areas of expertise: Complex systems; nonlinear dynamics and chaos; nonlinear time-series analysis and forecasting; natural language processing; countering hate and disinformation; information-theoretic measures on real-valued time series; information-theoretic measures for dynamic network analysis.

Academic Appointments

Arizona State University's Global Security Initiative
Center on Information and Narrative Complexity, Tempe, Arizona
Interim Director & Associate Research Professor — March 2025-Present

Arizona State University's Global Security Initiative
Center on Narrative, Disinformation and Strategic Influence, Tempe, Arizona
Interim Director — May. 2023-March 2025
Associate Research Professor — Feb. 2022-March 2025

Santa Fe Institute, Santa Fe, New Mexico
Founding Applied Complexity Fellow — Sept. 2019-Nov. 2021
Omidyar Fellow — Aug. 2016-2019

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

Education

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 and Computer Science with Highest Distinction
Colorado Mesa University — May 2009

Funding

- Defense Advanced Research Project Agency (DARPA): #HR001125C0316 — 2025
  PI: J. Garland — $684K
  Title: "CONNECT: Crafting Optimized Narrative to Navigate and Enhance Communication and Trust"
  Role: PI

- The William & Flora Hewlett Foundation — 2025
  PI: J. Garland — $150K
  Title: "A roadmap to combat disinformation in the news ecosystem."
  Role: PI

- Defense Advanced Research Project Agency (DARPA): #K003088-00-S02 — 2020-2025
  PI: J. Garland — $1M
  DARPA Program: "Semantic Forensics (SemaFor)" Title: "Semantic Information Defender (SID)"
  Role: PI

- Office of Naval Research (ONR): #AWD00035492 — 2022-2025
  PI: E. Steiner — $2M
  Title: "Fusing Narrative and Social Cyber Forensics to understand Covert Influence"
  Role: Co-Investigator

- Office of Naval Research (ONR): #N00014-22-1-2604 — 2022-2024
  PI: E. Steiner — $374k

Title: "Fusing Narrative and Social Cyber Forensics to understand Covert Influence - Malaysia"
Role: Co-Investigator

- Office of Naval Research (ONR): #N00014-22-1-2596 2022-2025
  PI: S. Corman $1.1M
  Title: "Generative Narrative Networks for Strategic Analysis and Forecasting Conflict"
  Role: Co-Investigator

- National Science Foundation EAGER #1807478 2017-2020
  PI: J. Garland $193K
  Title: "Targeted resampling of deep polar ice cores using information theory"
  Role: PI and Co-Author

- W.W. Smith Chartable Trust - Heart Research Program 2016
  PI: H. Ashikaga $100K
  Title: "Manipulating Communication Networks of Human Atrial Fibrillation"
  Role: Co-Investigator 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 and Co-Author

Publications

I. Journal Papers († represents joint first author)

[25] Elizabeth Bradley, James W. C. White, and Joshua Garland. Thoughtful data analysis. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 34(10):101502, 10 2024

[24] Elizabeth A. Hobson, Sanjay Prasher, Gerald Carter, and Joshua Garland. An interactive online game that uses simulations of hunting vampire bats to introduce students to coding. *Advances in Biology Laboratory Education*, 44, 2024

[23] Laurent Hébert-Dufresne, Antoine Allard, Joshua Garland, Elizabeth A. Hobson, and Luis Zaman. The path of complexity. *npj Complexity*, 1(4), 2024

[22] Albert B. Kao, Amanda K. Hund, Fernando P. Santos, Jean-Gabriel Young, Deepak Bhat, Joshua Garland, Rebekah A. Oomen, and Helen F. McCreery. Opposing responses to scarcity emerge from functionally unique sociality drivers. *The American Naturalist*, 202(3), 2023

[21] Varad Deshmukh, Robert Meikle, Elizabeth Bradley, James D. Meiss, and Joshua Garland. Using scaling-region distributions to select embedding parameters. *Physica D: Nonlinear Phenomena*, 446:133674, 2023

[20] Tyler R. Jones, Bradley R. Markle, William H. G. Roberts, Kurt M. Cuffey, C. Max Stevens, Eric J. Steig, T. J. Fudge, Michael Sigl, Abigail G. Hughes, Joshua Garland, Bo M. Vinther, Kevin S. Rozmiarek, Chloe A. Brashear, and James W. C. White. Seasonal temperatures in west antarctica during the holocene. *Nature*, 613(7943):292–297, 2023

[19] Joshua Garland, Keyan Ghazi-Zahedi, Jean-Gabriel Young, Laurent Hébert-Dufresne, and Mirta Galesic. Impact and dynamics of hate and counter speech online. *EPJ Data Science*, 11(1):3, 2022

[18] Varad Deshmukh, Elizabeth Bradley, Joshua Garland, and James D. Meiss. Toward automated extraction and characterization of scaling regions in dynamical systems. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 31(12):123102, 2021

[17] Michael Neuder, Elizabeth Bradley, Edward Dlugokencky, James W. C. White, and Joshua Garland. Detection of local mixing in time-series data using permutation entropy. *Phys. Rev. E*, 103:022217, 2021

[16] Varad Deshmukh, Elizabeth Bradley, Joshua Garland, and James D. Meiss. Using curvature to select the time lag for delay reconstruction. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 30(6):063143, 2020

[15] Joshua Garland†, Tyler R. Jones†, Michael Neuder, James W. C. White, and Elizabeth Bradley. An information-theoretic approach to extracting climate signals from deep polar ice cores. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 29(10):101105, 2019

[14] Elizabeth A. Hobson, Vanessa Ferdinand, Artemy Kolchinsky, and Joshua Garland. Rethinking animal social complexity measures with the help of complex systems concepts. *Animal Behaviour*, 155:287 – 296, 2019

[13] Joshua Garland†, Tyler R. Jones†, Michael Neuder, Valerie Morris, James W. C. White, and Elizabeth Bradley. Anomaly detection in paleoclimate records using permutation entropy. *Entropy*, 20(12):931, 2018

[12] Frank Pennekamp†, Alison C. Iles†, Joshua Garland, Georgina Brennan, Ulrich Brose, Ursula Gaedke, Ute Jacob, Pavel Kratina, Blake Matthews, Stephan Munch, Mark Novak, Gian Marco Palamara, Björn C. Rall, Benjamin Rosenbaum, Andrea Tabi, Colette Ward, Richard Williams, Hao Ye, and Owen L. Petchey. The intrinsic predictability of ecological time series and its potential to guide forecasting. *Ecological Monographs*, 89(2):e01359, 2019

[11] Jonathan N Pruitt, Andrew Berdahl, Christina Riehl, Noa Pinter-Wollman, Holly V Moeller, Elizabeth G Pringle, Lucy M Aplin, Elva JH Robinson, Jacopo Grilli, Pamela Yeh, Van M Savage, Michael H Price, Joshua Garland, Margaret C Gilby, Ian Cand Crofoot, Grant N Doering, and Elizabeth A Hobson. Social tipping points in animal societies. *Proceedings of the Royal Society B: Biological Sciences*, 285(1887):20181282, 2018

[10] Joshua Garland, Andrew M. Berdahl, Jie Sun, and Erik M. Bollt. Anatomy of leadership in collective behaviour. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 28(7):075308, 2018. **Most Dowloaded Paper of 2018 for CHAOS.**

[9] Susumu Tao, Samuel F. Way, Joshua Garland, Jonathan Chrispin, Luisa A Ciuffo, Muhammad A Balouch, Saman Nazarian, David D Spragg, Joseph E Marine, Ronald D Berger, et al. Ablation as targeted perturbation to rewire communication network of persistent atrial fibrillation. *PloS ONE*, 12(7):e0179459, 2017

[8] Joshua Garland, Elizabeth Bradley, and James D. Meiss. Exploring the topology of dynamical reconstructions. *Physica D: Nonlinear Phenomena*, 334:49 – 59, 2016

[7] J. Garland, R. G. James, and E. Bradley. Leveraging information storage to select forecast-optimal parameters for delay-coordinate reconstructions. *Physical Review E*, 93(2):022221, 2016

[6] J. Garland and E. Bradley. Prediction in projection. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 25:123108, 2015

[5] D. Darmon, E. Omodei, and J. Garland. Followers are not enough: A multifaceted approach to community detection in online social networks. *PloS one*, 10(8):e0134860, 2015

[4] Hiroshi Ashikaga, José Aguilar-Rodríguez, Shai Gorsky, Elizabeth Lusczek, Flávia Maria Darcie Marquitti, Brian Thompson, Degang Wu, and Joshua Garland. Modelling the heart as a communication system. *Journal of The Royal Society Interface*, 12(105):20141201, 2015

[3] Erik Komendera, Joshua Garland, Elizabeth Bradley, and Daniel J Scheeres. Efficiently evaluating reachable sets in the circular restricted 3-body problem. *IEEE Transactions on Aerospace and Electronic Systems*, 51(1):454–467, 2015

[2] Joshua Garland, Ryan. G. James, and Elizabeth Bradley. Model-free quantification of time-series predictability. *Physical Review E*, 90(5):052910, 2014

[1] Z. Alexander, J. D. Meiss, E. Bradley, and J. Garland. Iterated function system models in data analysis: Detection and separation. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 22(2):023103, 2012

II. Refereed Conference Papers

[10] Amrita Bhattacharjee, Raha Moraffah, Joshua Garland, and Huan Liu. Zero-shot LLM-guided Counterfactual Generation: A case study on NLP Model Evaluation. In proceedings of 2024 IEEE International Conference on Big Data, 2024

[9] Lin Ai, Tharindu Sandaruwan Kumarage, Amrita Bhattacharjee, Zizhou Liu, Zheng Hui, Michael S. Davinroy, James Cook, Laura Cassani, Kirill Trapeznikov, Matthias Kirchner, Arslan Basharat, Anthony Hoogs, Joshua Garland, Huan Liu, and Julia Hirschberg. Defending against social engineering attacks in the age of LLMs. In *EMNLP'24*, 2024

[8] Jimin Mun, Cathy Buerger, Jenny T Liang, Joshua Garland, and Maarten Sap. Counterspeakers' perspectives: Unveiling barriers and ai needs in the fight against online hate. In *Proceedings of the CHI Conference on Human Factors in Computing Systems*, CHI '24, New York, NY, USA, 2024. Association for Computing Machinery

[7] Amrita Bhattacharjee, Raha Moraffah, Joshua Garland, and Huan Liu. Towards LLM-guided causal explainability for black-box text classifiers. In *Accepted at Responsible Language Model workshop at AAAI 2024.*, 2024

[6] *How Reliable Are AI-Generated-Text Detectors? An Assessment Framework Using Evasive Soft Prompts.* Findings of EMNLP23., 2023

[5] Tharindu Kumarage, Amrita Bhattacharjee, Djordje Padejski, Kristy Roshke, Dan Gillmore, Huan Liu, and Joshua Garland. J-guard: Journalism guided adversarially robust detection of ai-generated news. Accepted at IJCNLP-AACL 2023, 2023

[4] Joshua Garland, Keyan Ghazi-Zahedi, Jean-Gabriel Young, Laurent Hébert-Dufresne, and Mirta Galesic. Countering hate on social media: Large scale classification of hate and counter speech. In *Proceedings of the Fourth Workshop on Online Abuse and Harms*, pages 102–112, Online, November 2020. Association for Computational Linguistics

[3] Joshua Garland, Tyler R. Jones, Elizabeth Bradley, Ryan G. James, and James W. C. White. A first step toward quantifying the climate's information production over the last 68,000 years. In *Advances in Intelligent Data Analysis XV. IDA 2016*, volume 9897 of *Lecture Notes in Computer Science*, pages 343–355. Springer, 2016

[2] Joshua Garland and Elizabeth Bradley. On the importance of nonlinear modeling in computer performance prediction. In *Advances in Intelligent Data Analysis XI. IDA 2012*, volume 8207 of *Springer Lecture Notes in Computer Science*, pages 210–222. Springer, 2013. **IDA-13 Frontier Prize Recipient**

[1] Joshua Garland and Elizabeth Bradley. Predicting computer performance dynamics. In *Advances in Intelligent Data Analysis X. IDA 2011*, volume 7014 of *Lecture Notes in Computer Science*, pages 173–184. Springer, 2011

II. Refereed Book Chapters

[2] Tharindu Kumarage, Amrita Bhattacharjee, and Joshua Garland. *Harnessing Artificial Intelligence to Combat Online Hate: Exploring the Challenges and Opportunities of Large Language Models in Hate Speech Detection.* Online Hate Speech Trilogy - Vol III: Methods, Techniques and AI Solutions in the Age of Hostilities. Preprint Available at https://arxiv.org/abs/2403.08035., 2024

[1] Joshua Garland and Catherine Buerger. *Seeing the full picture: The value of interdisciplinary counterspeech research.* Counterspeech Multidisciplinary Perspectives on Countering Dangerous Speech. Routledge, 1st edition, 2023

III. Refereed Abstracts

1. 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

[9] Alina Herderich, Jana Lasser, Segun Aroyehun, David Garcia, Mirta Galesic, and Joshua Garland. Measuring complex psychological and sociological constructs in large-scale text. Behavior Research Methods. Preprint available at http://osf.io/tzc9p., 2025

[8] Michael Simeone, Kristy Roschke, Shawn Walker, and Joshua Garland. Value and vulnerability: A framework for understanding the complexity of misinformation use. *npj Complexity*, 2024

[7] Tharindu Kumarage, Cameron Johnson, Jadie Adams, Lin Ai, Matthias Kirchner, Anthony Hoogs, Joshua Garland, Julia Hirschberg, Arslan Basharat, and Huan Liu. Personalized attacks of social engineering in multi-turn conversations -LLM agents for simulation and detection. *ARR*, 2024

[6] Ekaterina Landgren, Jeremiah Osborne-Gowey, Joshua Garland, Maxwell T. Boykoff, and Matthew G. Burgess. Why does the U.S. public underestimate climate policy support? PNAS, 2024

[5] Amrita Bhattacharjee, Raha Moraffah, Joshua Garland, and Huan Liu. "No effort is ever wasted": Learning to detect AI-generated text from unseen LLMs. In *ACL ARR*, 2024

[4] Valentina Semenova, Simon DeDeo, Renee DiResta, Joe Bak-Coleman, Chris Kempes, Jan Eissfeldt, Chris Slowe, Susan Benesch, Thalia Wheatley, John Irons, Joshua Garland, Paul Smaldino, Seungwoong Ha, and Annie Stephenson. Friction and the case against efficiency in social media. Nature Human Behaviour, 2024

[3] Amrita Bhattacharjee, Raha Moraffah, Joshua Garland, and Huan Liu. Eagle: A domain generalization framework for ai-generated text detection. In *European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases 2024 (ECMLPPKDD24).* Available at arXiv:2403.15690v1, 2024

[2] Tharindu Kumarage, Garima Agrawal, Paras Sheth, Raha Moraffah, Aman Chadha, Joshua Garland, and Huan Liu. A survey of ai-generated text forensic systems: Detection, attribution, and characterization. In *Submitted to Transactions of the Association for Computational Linguistics.*, 2024

[1] Jana Lasser, Alina Herderich, Joshua Garland, Segun Aroyehun, David Garcia, and Mirta Galesic. Collective moderation of hate, toxicity, and extremity in online discussions. PNAS Nexus, 2024

V. Other Publications

[12] Nadya Bliss, David Danks, Sanmay Das, Joshua Garland, Rachel Greenstadt, David Jensen, Manish Parashar, Ufuk Topcu, and Haley Griffin. Research challenges for a healthy and robust information ecosystem. Technical report, CCC, 2024

[11] Amrita Bhattacharjee, Raha Moraffah, Joshua Garland, and Huan Liu. LLMs as counterfactual explanation modules: Can chatGPT explain black-box text classifiers? Submitted to COLING 2023. Arxiv available at arxiv.org/2309.13340., 2023

[10] Tharindu Kumarage, Joshua Garland, Kirill Trapeznikov, Amrita Bhattacharjee, Scott Ruston, and Huan Liu. Stylometric detection of machine generated text in twitter timelines. Preprint available at https://arxiv.org/abs/2303.03697., 2022

[9] N. Bliss, E. Bradley, J. Garland, F. Menczer, S. Ruston, K. Starbird, and C. Wiggins. An agenda for disinformation research. Technical report, https://cra.org/ccc/resources/ccc-led-whitepapers/#2020-quadrennial-papers, 2020

[8] G. Bacaksizlar, S. Crabtree, J. Garland, N. Grefenstette, A. Kao, D. Kinney, A. Kolchinsky, T. Marghetis, M. Price, M. Riolo, H. Shimao, A. Teufel, T. van der Does, and V. Chuqiao Yang. Greetings from a triparental planet. *Available at arxiv.org/abs/2011.01508*, 2020

[7] S. Rankin, A. Mathewson, M. Moses, G. M. Fricke, K. Powers, G. R. Sanchez, C. Moore, E. Bradley, M. Galesic, and J. Garland. Regarding docket no. fr-6111-p-02, hud's implementation of the fair housing act's disparate impact standard. Technical report, Regulations.Gov, October 2019

[6] J. Garland and E. Bradley, "Information Theory in Earth and Space Science," SIAM News, October 2018.

[5] 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.

[4] 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.

[3] 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.

[2] J. Garland, R. James, and E. Bradley, "Determinism, Complexity, and Predictability of Computer Performance" `arXiv:1305.5408`, 2013.

[1] 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.

Invited Presentations and Keynote Addresses

[45] *Joshua Garland*, "Disinformation Workshop: Media Responsibility in the age of disinformation," State Department International Visitor Leadership Program Workshop. Phoenix, Arizona. November 13th, 2024

[44] *Joshua Garland*, "Democracy in the Age of Disinformation: Challenges and Potential Solutions," CattleTrack Talks. Scottsdale, Arizona. November 12th, 2024

[43] *Joshua Garland*, "Navigating the Age of Falsehoods: Strategies for Understanding, Healing, and Counteracting Information Warfare," Arts & Sciences: Telluride 2024 The Nature of Information. Telluride, Colorado. July 20, 2024

[42] *Joshua Garland* and Tharindu Kumarage, "Generative AI & Journalism: Friends or Foes," Study of the U.S. Institutes for Scholars (SUSI) Program, Tempe, Arizona, June 26, 2024.

[41] *Joshua Garland*, "Disinformation Workshop: Media Responsibility in the age of disinformation," Study of the U.S. Institutes for Scholars (SUSI) Program, Tempe, Arizona, June 25, 2024.

[40] *Joshua Garland* ?Sources of Information: How to navigate a polluted information environment,? Global Ties Arizona?s Young Diplomats Program, Phoenix, Arizona, June 11, 2024.

[39] *Joshua Garland* "Democracy in the Age of Disinformation: Challenges and Potential Solutions," Sagewood Community Lecture Series, Scottsdale, AZ. April 4, 2024

[38] *Joshua Garland*, "Artificial Intelligence, Disinformation and the Threats Posed to Democratic Societies," New Mexico State Legislature's Science, Technology and Telecommunications Committee July Session, Los Alamos, New Mexico, July 24, 2023.

[37] *Joshua Garland*, "Introduction to Narrative, Disinformation and Strategic Influence Research," Study of the U.S. Institutes for Scholars (SUSI) Program, Tempe, Arizona, June 26, 2023.

[36] *Joshua Garland* "Media Literacy Workshop: How to navigate a polluted information environment," Global Ties Arizona's Inaugural Young Diplomats Program, Tempe, Arizona, June 15, 2023.

[35] *Joshua Garland*, Jana Lasser, Alina Herderich, Segun Aroyehun, David Garcia, and Mirta Galesic. "Collective moderation of hate, toxicity, and extremity in online discussions," ASU's Biodesign Center for Biocomputing, Security and Society Brown Bag Seminar, Tempe, Arizona, March 23, 2023.

[34] *J. Garland*, "Impact and Dynamics of Hate and Counter Speech Online," University of Colorado at Boulder's Complex/Dynamical Systems Seminar Series. Boulder, Colorado. November 10, 2022.

[33] *J. Garland*, "Impact and Dynamics of Hate and Counter Speech Online," The Aarhus '22 Conference on Online Hostility and Bystanders. Aarhus, Denmark. June 09, 2022.

[32] *J. Garland*, "Introduction to Classification of Counter Speech on Twitter," The Aarhus '22 Conference on Online Hostility and Bystanders Workshop. Aarhus, Denmark. June 08, 2022.

[31] *J. Garland*, "Impact and Dynamics of Hate and Counter Speech Online," Disinformation Working Group, Arizona State University's Global Security Initiative Center for Narratives, Disinformation and Strategic Influence. May 23, 2022.

[30] *J. Garland*, "An agenda for disinformation research," Illinois Political Science Association Virtual Conference. November 13, 2021.

[29] *J. Garland*, "Impact and Dynamics of Hate and Counter Speech Online: Can hate be countered," Understanding and Automating Counterspeech Workshop, Cambridge Centre for Research in the Arts, Social Sciences and Humanities. September 29, 2021.

[28] *J. Garland*, "An agenda for disinformation research," Strategic Multilayer Assessment (SMA) Integrating Information in Joint Operations (IIJO) Speaker Series. July 20, 2021.

[27] *J. Garland*, *C. Newman*, *L. Haske* and *L. St. John* "Speech So Vile: Context, Constitutionality and Consequences of Hate Speech," MPSA Annual Conference. April 15, 2021.

[26] *J. Garland* and *M. Galesic* "Impact and Dynamics of Hate and Counter Speech Online: Can hate be countered," ScienceWriters2020 Virtual Conference. October 19, 2020.

[25] *J. Garland* "Countering Hate on Social Media: A large-scale case study on the impact of coordination," Santa Fe Institute's Counterbalance Seminar. September 30, 2020.

[24] *J. Garland* "Inference of dynamical systems and break point detection," Impersonal trends, big ideas and great leaders workshop. Santa Fe, NM. January 22, 2020.

[23] *J. Garland* "Fighting Nazis in a digital age: Can hate be countered?!," Postdocs in Complexity Conference. Santa Fe, NM. August 28, 2019.

[22] *J. Garland*, K. Ghazi-Zahedi, M. Galesic "Fighting Nazis in a digital age: Can hate be countered?," SciWri 2019. Santa Fe, NM. May 7, 2019.

[21] *K. Ghazi-Zahedi*, J. Garland, M. Galesic "How effective is counter-speech for countering cyberhate?," ODYSSEUS EU Meeting. Leipzig, Germany Nov. 15, 2018.

[20] *J. Garland* "Nonlinear Time Series Analysis," Scripps Institution of Oceanography Seminar Series. La Jolla, California. Oct. 25, 2018.

[19] *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.

[18] *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.

[17] *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

[16] *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

[15] *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.

[14] *J. Garland*, "Prediction in Projection," University of Colorado, Department of Applied Mathematics Dynamical Systems Seminar. Boulder, Colorado. September 17, 2015.

[13] *J. Garland*, "Prediction in Projection," Max-Planck-Institut Für Mathematik in den Naturwissenschaften, Institute Colloquium. Leipzig, Germany. April 29, 2015.

[12] *J. Garland*, "Prediction in Projection," Max-Planck-Institut Für Physik Komplexer Systemer, Nonlinear Time Series Analysis Seminar. Dresden, Germany. April 9, 2015.

[11] *J. Garland*, "Prediction in Projection," University of California Davis, Complexity Sciences Center Seminar. Davis, California. November 12, 2014.

[10] *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.

[9] *J. Garland*, "Exploring Complexity: Mathematics *Beyond* Calculus," Colorado Mesa University 16^{th} Annual Math Extravaganza **Keynote Address**. Grand Junction, Colorado. February 13, 2014.

[8] *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.

[7] *J. Garland*, "Modeling Computer Dynamics: Can Complexity Overshadow Determinism?," Institut des Systémes Complexes de Paris Ile-de-France Colloquium. Paris, France. October 23, 2013.

[6] *J. Garland* and *J. Tsai*, "Grading Problems in STEM Disciplines," University of Colorado Graduate Teaching Program Fall Intensive. Boulder, Colorado. August 23, 2012.

[5] *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.

[4] *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.

[3] *J. Garland*, "Modeling and Predicting the Dynamics of Computer Performance," University of Manchester Mathematics Department Colloquium. Manchester, England. October 27, 2011.

[2] *J. Garland*, "Grading Problems in STEM Disciplines," University of Colorado Graduate Teaching Program Fall Intensive. Boulder, Colorado. August 18, 2011.

[1] *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

[39] *E. Landgren*, J. Osborne-Gowey, J. Garland, M. G. Burgess , "Echo Chambers and False Balance: Understanding Underestimation of Climate Policy Support," International Conference on Computational Social Science 2024 (IC2S2), Philadelphia, Pennsylvania. July 18, 2024.

[38] *E. Bradley*, J.D.. Meiss, J. Garland, V. Deshmukh and R. Meikle, "Using Scaling-Region Distributions to Select Embedding Parameters," SIAM Conference on Applications of Dynamical Systems (DS23), Portland, Oregon. May 18, 2023.

[37] *E. Landgren*, M. Burgess, J. Garland, "Modeling Misperception of Public Support for Climate Policy," SIAM Conference on Applications of Dynamical Systems (DS23), Women in Network Science Minisymposium. Portland, Oregon. May 14, 2023.

[36] Jana Lasser, *Alina Herderich*, Joshua Garland, Segun Aroyehun, David Garcia, and Mirta Galesic. "Improving discourse quality in online discussions: A large-scale, longitudinal study of influencing speech characteristics," The 9th International Conference on Computational Social Science (IC2S2 2023), Copenhagen, Denmark, July 18, 2023.

[35] *E. Bradley*, J.D.. Meiss, J. Garland, V. Deshmukh and R. Meikle, "Using Scaling-Region Distributions to Select Embedding Parameters," Dynamics Days US, Virtual. January 10, 2023.

[34] *Jana Lasser* , Alina Herderich, David Garcia, Mirta Galesic and Joshua Garland, "Taxonomy and automated detection of counter speech strategies using deep learning models," The Aarhus '22 Conference on Online Hostility and Bystanders. Aarhus, Denmark. June 10, 2022

[33] *Michael Neuder*, Elizabeth Bradley, Edward Dlugokencky, James W. C. White, and Joshua Garland. Detection of local mixing in time-series data using permutation entropy. Dynamic Days 2021. Nice, France. August 27, 2021.

[32] *Varad Deshmukh*, Joshua Garland, James D. Meiss and Elizabeth Bradley, "Towards Automated Extraction and Characterization of Scaling Regions". SIAM Conference on Applications of Dynamical Systems (DS21). May 24, 2021

[31] *J. Garland*, K. Ghazi-Zahedi, J-G Young, L.Hebert-Dufresne, and M. Galesic. "Impact and Dynamics of Hate and Counter Speech Online". SIAM Conference on Applications of Dynamical Systems (DS21). May 23, 2021

[30] E. Bradley, *M. Neuder*, J. W. C. White, E. Dlugokencky and J. Garland. "Detection of Local Mixing in Time-Series Data Using Permutation Entropy". EGU General Assembly 2021. April 29, 2021.

[29] *J. Garland*, K. Ghazi-Zahedi, J-G Young, L. Hebert-Dufresne, and M. Galesic. "Countering hate on social media: Large scale classification of hate and counter speech". The 4th ACL Workshop on Online Abuse and Harms. November 20, 2020.

[28] *M. Smyth*, C. Buntain, D. Dwyer, J. Finn, J. Jones, J. Garland, M.Egan "Information Processing on Social Media Networks as Emergent Collective Intelligence," ACM Collective Intelligence 2020. Virtual Conference June 18, 2020.

[27] *J. Garland*, J.-G. Young, M. Galesic, K. Ghazi-Zahedi and L Hébert-Dufresne, "How effective is counterspeech for resisting cyberhate?," Max-Planck-Institut Für Physik Komplexer Systemer Workshop on Dynamical Methods in Data-based Exploration of Complex Systems. Dresden, Germany. October 10, 2019.

[26] *J. Garland*, V. Deshmukh and E. Bradley, "Nonlinear Time-Series Analysis of a Paleoclimate Temperature Record from Antarctica," Max-Planck-Institut Für Physik Komplexer Systemer Workshop on Dynamical Methods in Data-based Exploration of Complex Systems. Dresden, Germany. October 7, 2019.

[25] *J. Garland*, J.-. Young, M. Galesic, K. Ghazi-Zahedi and L Hébert-Dufresne, "How hate trees grow: Interactions of hate speech and counterspeech groups in Twitter reply trees," Network Science 2019, NetSci 4 Social Good Satelite. Burlington, Vermont. May 27, 2019.

[24] *E. Bradley*, V. Deshmukh and J. Garland, "Curvature Based Parameter Selection for Delay-Coordinate Reconstruction," SIAM Conference on Applications of Dynamical Systems (DS19). Snowbird, Utah. May 23, 2019.

[23] *J. Garland*, V. Deshmukh and E. Bradley, "Nonlinear Time-Series Analysis of a Paleoclimate Temperature Record from Antarctica," SIAM Conference on Applications of Dynamical Systems (DS19). Snowbird, Utah. May 23, 2019.

[22] *J. Garland*, T.R Jones, M. Neuder, J.W.C. White and E. Bradley "Anomaly Detection in Paleoclimate Records Using Permutation Entropy," SIAM Conference on Mathematical & Computational Issues in the Geosciences (GS19). Houston, Texas. March 12, 2019.

[21] 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.

[20] *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.

[19] 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.

[18] 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.

[17] 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.

[16] *J. Garland*, and E. Bradley, "Prediction in Projection," Conference on Complex Systems 2015 (CCS'15). Tempe, Arizona. Oct. 2, 2015.

[15] 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.

[14] *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.

[13] *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.

[12] *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.

[11] *J. Garland* and E. Bradley, "Prediction in Projection," SIAM Conference on Applications of Dynamical Systems (DS15). Snowbird, Utah. May 17, 2015.

[10] 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.

[9] 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.

[8] *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.

[7] *E. Bradley* and J. Garland, "Analysis & Prediction of Computer Performance Dynamics," XII Experimental Chaos and Complexity Conference. Ann Arbor, Michigan. May 18, 2012.

[6] *J. Garland* and E. Bradley, "Prediction of Computer Dynamics," SIAM Conference on Applications of Dynamical Systems (DS11). Snowbird, Utah. May 23, 2011.

[5] *J. Garland*, "Prediction in Projection: Computer Performance Forecasting, A Dynamical Systems Approach," SIAM Front Range Student Conference. Denver, Colorado. March 5, 2011.

[4] *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.

[3] *J. Garland*, "p-adic Numbers," MAA MathFest 2008. Madison, Wisconsin. July 31, 2008.

[2] *J. Garland*, "p-adic Numbers," Colorado Mesa University Student Scholars Symposium. Grand Junction, Colorado. April 28, 2008. **Best Talk Recipient.**

[1] *J. Garland*, "p-adic Numbers," Colorado Mesa University Mathematics, Statistics and Computer Science Department Colloquium. Grand Junction, Colorado. April 25, 2008.

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.

- Gabriel Goren: Inferring Finite State Machines from Time Series*[Summer 2019]*
- David Armendariz: Topological Reconstruction of Antarctica's Paleoclimate System Using a Deep Polar Ice Core *[Summer 2019]*
- Michael Neuder: Automated UAV Animal Tracking with Deep Neural Nets *[Summer 2018]*
- Benjamin Anker: Prejudice Detection through Part of Speech Drift*[Summer 2018]*

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 & 2019]*
- Nick Dow: Intro to Complexity and Data Science *[Summer 2018]*
- Robert Shyroian: Intro to Complexity and Data Science *[Summer 2019]*

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

- Theo Lincke: Predicting Solar Flares Using Machine Learning and Computational Topology
  Departments of Applied Mathematics *[6/21-Present]*
- 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 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

Professional Service

Conference, Workshop and Symposium Organizer

CounterBalance co-founder and co-organizer Fall 2020 - Present
The Santa Fe Institute's CounterBalance is an applied seminar series on disinformation, hate and counter speech, social polarization, narratives and belief dynamics. The intention of these meetings is two-fold. First, these seminars provide a clearing house for practitioners, policy makers, and scholarly researchers to share and discuss new insights from these interdependent areas. Second, these seminars provide an opportunity to contextualize these new insights within a broader understanding of dynamic complex adaptive systems.

Collective Crypto Workshop: Exploring the Role of Collective Effects in Crypto Network & Token Design June 13, 2019

Sociality under Scarcity Feb. 4-7, 2019
Research has enumerated a variety of costs and benefits of sociality, but how these costs and benefits change in different environmental contexts is not well understand. A survey across biological species reveals a seemingly paradoxical observation: under conditions of resource scarcity, some species become less social, while other species become more social. This meeting seeks to answer how and why resource scarcity alters the consequences of sociality in different ways for different species.

Santa Fe Institute Slice of Science Seminar 2017-2019

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

The International Conference for Computational Social Science (IC2S2 2025) 2025
Peer-reviewed manuscripts for conference proceedings

ECAI-2024 Program Commitee 2024
Peer-reviewed manuscripts for conference proceedings

Workshop on Online Abuse and Hate (WOAH) 2024-Present
Peer-reviewed manuscripts for conference proceedings

Complex Systems Summer School Applicant Review Committee 2013-2022
Reviewed and ranked a selection of applicants for the Complex Systems Summer School

Omidyar Fellow Selection committee 2017-2022
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 2017-2019
Liaison between the Santa Fe Institute postdoctoral fellows and the science board.

Postdoctoral Representative to the Faculty 2017-2019
Liaison between the Santa Fe Institute postdoctoral fellows and the faculty.

Peer review

Journal Review: Chaos, Entropy, Physica D, Science Advances, Nature Ecology and Evolution, Nature Communications, Ecology Letters, Scientific Reports

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 2016-2019

Teaching Assistant

Santa Fe Institute Complexity Explorer
Nonlinear Dynamics: Mathematical and Computational Approaches Fall 2014

Lab Instructor
Santa Fe Institute
Complex Systems Summer School: Nonlinear Dynamics and Chaos Module — Summer 2011-2015

Instructor
University of Colorado
Teaching Excellence Seminar — Fall 2010

Recitation Instructor
University of Colorado

- Differential Equations with Linear Algebra — Spring 2010, Fall 2010
- Calculus II — Fall 2009

Colorado Mesa University

- Foundations of Computer Science — Fall 2006, 2008
- Probability and Statistics — Spring 2008
- Data Structures — Spring 2007

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

Other Employment

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
Colorado Mesa University Summer 2004 - Summer 2008