

# Curriculum Vitae

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## Amitava Banerjee

### Personal Information

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<b>Pronouns</b>	he/him, or they/them
<b>Date of Birth</b>	January 8, 1996
<b>Nationality</b>	Indian
<b>Office Address</b>	3353 A.V. Williams Bldg. 8223 Paint Branch Dr. College Park, 20740 Maryland, USA
<b>Phone</b>	+1 240 413 3686
<b>Designation</b>	Graduate Research Assistant (Fall 2018 - Present) <a href="#">Department of Physics</a> <a href="#">Institute for Research in Electronics and Applied Physics (IREAP)</a> University of Maryland, College Park, USA 20742
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### Academic Qualifications

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Degree	Institute	Subjects	Year
Bachelor of Science	<a href="#">Presidency University</a>	Physics	2016
Master of Science	<a href="#">Presidency University</a>	Physics	2018
Doctor of Philosophy	<a href="#">University of Maryland</a>	Physics	2018-present

### Current Research Interests

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In my doctoral work, I am broadly interested in understanding what artificial neural networks (ANNs) can discover by observing natural dynamics of complex systems - from the climate to the brain. My work shows that ANNs trained to mimic the dynamical behaviors of networks can be applied to infer causal interactions in the network. In cases where the actual network is unknown, ANNs trained on their dynamics can be even used to reconstruct the network and predict its future dynamics. Some specific applications of my work are listed.

- Development of machine learning techniques for analysis of networked dynamical systems
- Causal inference from time-series data in noisy and partially sampled systems with time-delayed interactions and applications in earth science and neuroscience.
- Inferring higher-order causal inference and applications in ecology and neuroscience.

## Publications

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ORCID ID [0000-0001-9241-3555](https://orcid.org/0000-0001-9241-3555)

ArXiv Publication Link [arxiv.org/a/banerjee\\_a\\_2](https://arxiv.org/a/banerjee_a_2)

Google Scholar [scholar.google.com/citations?user=JgqGlpyLGyUC](https://scholar.google.com/citations?user=JgqGlpyLGyUC) (citations: 46, h-index: 4)

1. 'Machine Learning for causal interaction estimation from near-whole-brain calcium imaging data', **A. Banerjee**, S. Chandra, E. Ott (in preparation)
2. 'Quantifying Interdependencies in Geyser Eruptions at the Upper Geyser Basin, Yellowstone National Park', W. F. Fagan, A. Swain, **A. Banerjee**, H. Ranade, P. Thompson, P. P.A. Staniczenko, B. Flynn, J. Hungerford, S. Hurwitz, *Journal of Geophysical Research: Solid Earth*, e2021JB023749 (2022).
3. 'Machine Learning Link Inference of Noisy Delay-coupled Networks with Opto-Electronic Experimental Tests', **A. Banerjee**, J. D. Hart, R. Roy, E. Ott, Preprint: *Physical Review X*, 11, 031014 (2021).
4. 'Using machine learning to assess short term causal dependence and infer network links', **A. Banerjee**, J. Pathak, R. Roy, J. G. Restrepo, E. Ott, *Chaos* 29, 121104 (2019).
5. 'An interplay of topology and quantized geometric phase for two different symmetry-class Hamiltonians', S. Rahul, Y. R. Kartik, **A. Banerjee**, S. Sarkar, *Physica Scripta* 94 115803 (2019).
6. 'Transient Chaos Generates Small Chimeras', **A. Banerjee** and D. Sikder, *Physical Review E* 98, 032220 (2018). Article figure was featured in *Phys. Rev. E Kaleidoscope* for September, 2018..
7. 'Bacteria Around an Acoustic Black Hole: Trapping and Frame-Dragging', **A. Banerjee**, R. Koley, P. Majumdar, Preprint: [arXiv:1808.01828](https://arxiv.org/abs/1808.01828) (2018).
8. 'Dynamical Phase Transitions in Generalized Kuramoto Model with Distributed Sakaguchi phase', **A. Banerjee**, *Journal of Statistical Mechanics: Theory and Experiment* 113402 (2017).
9. 'Spatiotemporal Dynamics of the Kuramoto-Sakaguchi Model with Time-dependent Connectivity', **A. Banerjee** and M. Acharyya, *Phys. Rev. E* 94, 022213 (2016). Article figure was featured in *Phys. Rev. E Kaleidoscope* for August, 2016.

### • Popular articles on my research

'Artificial intelligence discovers long-term influencers hiding in noisy systems', *Science X Dialog*, July 26, 2021.

'Neuromorphics for Network Discovery', *University of Maryland Physics Research News*, July 21, 2021.

'Neural Networks and Hidden Figures', *University of Maryland Physics graduate student spotlight*, September 4, 2020.

'An Unexpected Collaboration', Letter to the editor of *Physics* magazine, April 13, 2020.

## Awards and Fellowships

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1. Travel Award, *Society for Industrial and Applied Mathematics (SIAM) Conference on Dynamical Systems* 2021
2. Honorable Mention, *Ralph Myers and Friends of Physics Award for exceptional graduate teaching assistantship*, Spring 2019 and Spring 2020
3. Graduate school offers from physics departments of University of Maryland - College Park (with *Dean's Fellowship*), University of Colorado - Boulder, State University of New York - Buffalo (with *Presidential Fellowship*), University of Rochester, Georgia Institute of Technology, University of Waterloo (with *Mike and Ophelia Lazaridis Fellowship*)
4. American Physical Society (APS) *Distinguished Student Fellowship 2017* and invitation for oral presentation at the APS March Meeting 2018.
5. *Kishore Vaigyanik Protsahan Yojana* scholarship, Indian Institute of Science, 2013 (awarded to promising undergraduates who have the potential to become future scientist).
6. *INSPIRE* Fellowship, Department of Science and Technology, India, 2013, (awarded to the top 1% students out of approximately 300,000 students at the higher secondary (+2) level, who are pursuing bachelors degrees in the sciences).

## Presentations and Conferences

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1. Contributed Talk, “[Using Machine Learning for Inference of \*C. elegans\* Neural Network Structure from Calcium Fluorescence Time Series](#)”, Annual Meeting of the International Physics of Living Systems (iPoLS) Network, June 3, 2022.
2. Contributed Talk, “[Inference of \*C. elegans\* neural network structure from calcium fluorescence time series data with reservoir computing](#)”, American Physical Society March Meeting, March 14, 2022.
3. Contributed Talk, “[Neural connectivity inference from \*C. elegans\* whole-brain calcium-imaging data with reservoir computing](#)”, Satellite Meeting of the Conference on Complex Systems: Machine Learning Perspectives of Complex Networks, October 28, 2021.
4. Contributed Talk, “[Reservoir Computing for Link Inference of Noisy Networks from Time Series Data: Theory and Experiments](#)”, Society for Industrial and Applied Mathematics (SIAM) Conference on Dynamical Systems, May 23, 2021.
5. Contributed Talk, “[Neuromorphics for network inference: new techniques and validation in optoelectronic experiments](#)”, American Physical Society March Meeting, March 19, 2021.
6. Invited Talk (co-presented with Joseph Hart), “[Machine Learning for Non-invasive Network Link Inference](#)”, Complex Systems Society (CCS) Satellite Conference: Machine Learning Prospective for Complex Networks, held virtually, December 9, 2020.
7. Invited Talk, “[Using machine learning to assess short term causal dependence and infer network links](#)”, Applied Dynamics Seminar, Department of Physics and IREAP, University of Maryland - College Park, October 17, 2019.
8. Invited Pedagogical Lecture, “Machine Learning in Biology”, [Summer Internship Program, Center for Bioinformatics and Computational Biology \(CBCB\)](#), University of Maryland - College Park, July 17, 2019.
9. Invited Talk, “[Transiently Chaotic behavior in Superconducting Metamaterials](#)”, Applied Dynamics Seminar, Department of Physics and IREAP, University of Maryland - College Park, November 15, 2018.
10. Contributed Talk, “[Spatiotemporal Dynamics of the Kuramoto-Sakaguchi Model with Time-dependent Connectivity](#)”, American Physical Society March Meeting, March 7, 2018.

## Professional Activities

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1. **Reviewer:** [Physical Review Letters](#) (1 review, ongoing), [Physical Review E](#) (4 reviews), [Physical Review Research](#) (2 reviews), [Physical Review Applied](#) (2 reviews), [Chaos: An Interdisciplinary Journal of Nonlinear Science](#) (10 reviews)
2. **Co-organizer**, [Conference on Complex Systems Satellite: Artificial Intelligence in Complex Networks](#), Palma de Mallorca+online, 19 October, 2022.
3. **Co-organizer**, [Conference on Complex Systems Satellite: Machine Learning Perspectives of Complex Networks II](#), Lyon+online, 28 October, 2021.
4. **Volunteer and Co-lead**, [Graduate Resources for Advancing Diversity with Maryland Astronomy and Physics \(GRAD-MAP\)](#) (2020-Present).
5. Member, [IREAP-ROLE](#) task force on Diversity, Equity, and Inclusion (2020-Present).
6. Member, [Physics of Living Systems - Student Research Network](#) (2020-Present).
7. Mentor, [Toolkit for Success](#) (2022 Summer and 2021 Summer).
8. Member of the planning committee, University of Maryland [Multicultural Involvement Community Advocacy](#) events for [Asian American Pacific Islander and Desi American Heritage Month 2022](#) (Spring 2022).
9. Teaching assistant and curriculum developer, [The Computational Research Access Network \(CRANE\)](#) (Spring 2022).
10. Curriculum developer, [Girls Talk Math at UMD](#) (Summer 2021).
11. Social Media and Website Management Officer, [Women in Physics at the University of Maryland](#) (2019-2020).
12. Student member of the American Physical Society and member of APS Forums On Graduate Student Affairs ([FGSA](#)) and Outreach and Engaging the Public ([FOEP](#)) (2017-Present).

13. Chair of Scientific Organizing Committee [Undergraduate Physics Symposium](#), Presidency University, April 2017.

## References

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1. Prof. Edward Ott, [edott@umd.edu](mailto:edott@umd.edu)
2. Prof. Rajarshi Roy, [rroy@umd.edu](mailto:rroy@umd.edu)
3. Prof. Michelle Girvan, [girvan@umd.edu](mailto:girvan@umd.edu)