

Curriculum Vitae

Amitava Banerjee

Simons Center for Quantitative Biology, Cold Spring Harbor Laboratory,
One Bungtown Road, Cold Spring Harbor, NY 11724, USA
email: amitavab@cschl.edu, GitHub: banerjeeamitava

Education:

- 2018-2022 Doctor of Philosophy (Ph.D.) in Physics (Advisor: Edward Ott),
University of Maryland, College Park, MD 20742, USA
Dissertation: Developing Machine Learning Techniques for Network Connectivity
Inference from Time-Series Data
- 2016-2018 Master of Science in Physics
Presidency University, Kolkata, West Bengal, India-700037
Thesis: Bacteria around a Black Hole: Analogue Gravity with Active Nematic Fluid
- 2013-2016 Bachelor of Science in Physics
Presidency University, Kolkata, West Bengal, India-700037
Thesis: Collective Dynamics of Coupled Nonlinear Oscillators

Academic appointment:

- 2023 - Interdisciplinary Scholar in Experimental and Quantitative Biology, Simons Center for
Quantitative Biology, Cold Spring Harbor Laboratory.

Fellowships, honors and awards:

- 2024 Reviewer Excellence Award, American Physical Society (awarded to 45 reviewers
worldwide)
- 2022 National Science Foundation - Computation and Mathematics for Biological Networks
(NSF-COMBINE) Fellowship, University of Maryland
- 2021 Travel Award, Conference on Dynamical Systems, Society for Industrial and
Applied Mathematics
- 2020, 2019 Honorable Mention, Ralph Myers and Friends of Physics Award for exceptional
graduate teaching assistantship, Department of Physics, University of Maryland
- 2018-2019 University of Maryland College of Computer, Mathematical, and Natural Sciences
(CMNS) Dean's Fellowship
- 2018 Presidential Fellowship, State University of New York - Buffalo (declined)
- 2018 Mike and Ophelia Lazaridis Fellowship, University of Waterloo (declined)
- 2013-2018 Kishore Vaigyanik Protsahan Yojana (KVPY) Scholarship, Govt. of India (Fellowship
awarded to top 250 high school students in India)

- 2017 Distinguished Student Fellowship and invitation for oral presentation at the APS March Meeting 2018, Forum on International Physics (FIP), American Physical Society (awarded to 4 students from India in 2017)
- 2013 INSPIRE Fellowship, Department of Science and Technology, Government of India (declined).

Teaching and mentoring experience:

- 2023 Instructor and curriculum developer, Coding Camp, Women in Science and Engineering, Cold Spring Harbor Laboratory, USA
- 2022 Teaching assistant and curriculum developer, The Computational Research Access Network (CRANE), USA
- 2021 Curriculum developer, Girls Talk Math at University of Maryland, College Park
- 2018-2022 Teaching Assistant for the following courses at University of Maryland, College Park:
1. PHYS 121 (Fundamentals of Physics)
 2. PHYS 375 (Experimental Physics: Electromagnetic Waves, Optics and Modern Physics)
 3. PHYS 410 (Classical Mechanics)
 4. PHYS 715 (Chaotic Dynamics)
- 2018 - Mentored 6 undergraduates and one high school student for research on topics in complex systems science, machine learning, statistical modeling, and biological data analysis.

Scientific organizing experience:

- 2021 - Reviewer: Physical Review Letters (4 reviews), Physical Review X Life (3 reviews), Physical Review E (18 reviews), Physical Review Research (2 reviews), Physical Review Applied (4 reviews), Chaos: An Interdisciplinary Journal of Nonlinear Science (13 reviews), Optics Communications (2 reviews), Nature Scientific Reports (2 reviews), PLOS Computational Biology (2 reviews)
- 2025 Program committee member, Machine Learning in Computational Biology (MLCB 2025), New York Genome Center, USA
- 2021, 2022 Co-organizer: Conference on Complex Systems Satellites: Artificial Intelligence in Complex Networks, Palma de Mallorca, Spain and online (2022), and Machine Learning Perspectives of Complex Networks II, Lyon, France and online (2021)
- 2017 Chair of Scientific Organizing Committee, Undergraduate Physics Symposium, Presidency University, Kolkata.

Publications:

(Peer reviewed)

1. **A Banerjee**, DJ Pattinson, CL Wincek, P Bunk, A Axhemi, SR Chapin, S Navlakha, and HV Meyer, "Comprehensive epitope mutational scan database enables accurate T cell receptor cross-reactivity prediction," *Cell Systems*, doi: 10.1016/j.cels.2025.101345 (2025).
2. **A Banerjee**, S Chandra, E Ott, "Network inference from short, noisy, low time-resolution, partial measurements: Application to *C. elegans* neuronal calcium dynamics," *Proceedings of the National Academy of Sciences* 120, e2216030120 (2023).
3. MK Chessey, SD Negussie, MDM Smith, MA Chmielewski, KM Burson, **A Banerjee**, "Key features of a long-standing student-led women in physics mentoring program," *AIP Conference Proceedings* 231, 060008 (2023).
4. WF Fagan, A Swain, **A Banerjee**, H Ranade, P Thompson, "Quantifying Interdependencies in Geyser Eruptions at the Upper Geyser Basin, Yellowstone National Park," *Journal of Geophysical Research: Solid Earth* 127, e2021JB023749 (2022).
5. **A Banerjee**, JD Hart, R Roy, E Ott, "Machine Learning Link Inference of Noisy Delay-coupled Networks with Opto-Electronic Experimental Tests," *Physical Review X* 11, 031014 (2021).
6. S Rahul, YR Kartik, **A Banerjee**, S Sarkar, "An interplay of topology and quantized geometric phase for two different symmetry-class Hamiltonians," *Physica Scripta* 94, 115803 (2019).
7. **A Banerjee**, J Pathak, R Roy, JG Restrepo, E Ott, "Using machine learning to assess short-term causal dependence and infer network links," *Chaos* 29, 123012 (2019).
8. **A Banerjee**, D Sikder, "Transient chaos generates small chimeras," *Physical Review E* 98, 032220 (2018).
9. **A Banerjee**, "Dynamical phase transitions in generalized Kuramoto model with distributed Sakaguchi phase," *Journal of Statistical Mechanics: Theory and Experiment* 2017, 113402 (2017).
10. **A Banerjee**, M Acharyya, "Spatiotemporal dynamics of the Kuramoto-Sakaguchi model with time-dependent connectivity," *Physical Review E* 94, 022213 (2016).

(Preprints)

11. **A Banerjee**, R Koley, P Majumdar, "Bacteria around an acoustic black hole: Trapping and Frame-Dragging," *arXiv preprint* arXiv:1808.01828 (2018).
12. **A Banerjee**, M Acharyya, "Synchronized, Chimera and Multichimera States in Simple Cellular Automata Model of Coupled Oscillators," *arXiv preprint* arXiv:1601.06980 (2016).

(In preparation)

13. HV Meyer, S Dasgupta, **A Banerjee**, and S Navlakha, "Negative selection: a computer science perspective"
14. **A Banerjee***, J Henderson*, A Tiffeau-Mayer, and HV Meyer, "Physics of T cell receptor repertoires," PRX Life, Solicited review article (*co-first authors)

15. **A Banerjee**, S Navlakha, and HV Meyer, "Population coding of antigens by immune receptors reveals design principles of adaptive immunity"
16. A Kiedrowski[#], N Prasad[#], D Netz, **A Banerjee**, RK Prabakar, and HV Meyer, "Nuclear morphology as an indicator of thymic T cell development" ([#]undergraduate mentee).

Software and packages:

1. **A Banerjee** and H V Meyer, (2025). "BATMAN: Bayesian Inference of Activation of TCR by Mutant Antigens". Python package. <https://github.com/meyer-lab-cshl/BATMAN>.

Invited Talks:

1. Black Box Lecture, Benjamin Cowley Lab, Cold Spring Harbor Laboratory, NY, USA; 1 July 2025
2. Conference on Complex Systems, Satellite Conference: Machine Learning Prospective for Complex Networks, Complex Systems Society, Online; 9 December 2020
3. Applied Dynamics Seminar, Department of Physics and IREAP, University of Maryland, College Park, MD, USA; 17 October 2019
4. Applied Dynamics Seminar, Department of Physics and IREAP, University of Maryland, College Park, MD, USA; 15 November 2018
5. Center for Bioinformatics and Computational Biology Undergrad Summer Internship Program, University of Maryland, College Park, MD, USA; 17 July 2019
6. Undergraduate Research Symposium, Department of Physics, Presidency University, Kolkata, India; 2018.

Contributed talks:

1. **A Banerjee**, P Bunk, S Navlakha, and HV Meyer; Systems Immunology Meeting 2023, Cold Spring Harbor Laboratory, NY, USA; April 21, 2023, "Quantitative modeling and analysis of TCR cross-reactivity"
2. **A Banerjee**, S Chandra, E Ott; International Physics of Living Systems (iPoLS) Network, Annual Meeting 2022, Montpellier, France; June 3, 2022, "Using Machine Learning for Inference of *C. elegans* Neural Network Structure from Calcium Fluorescence Time Series"
3. **A Banerjee**, S Chandra, E Ott; American Physical Society (APS) March Meeting, Online and Chicago, IL; March 14, 2022, "Inference of *C. elegans* Neural Network Structure from Calcium Fluorescence Time Series Data with Reservoir Computing"
4. **A Banerjee**, S Chandra, E Ott; Satellite Meeting of the Conference on Complex Systems: Machine Learning Perspectives of Complex Networks, Online; October 28, 2021, "Neural Connectivity Inference from *C. elegans* Whole-Brain Calcium-Imaging Data with Reservoir Computing"
5. **A Banerjee**, J Hart, R Roy, E Ott; Society for Industrial and Applied Mathematics (SIAM) Conference on Dynamical Systems, Online; May 23, 2021, "Reservoir Computing for Link Inference of Noisy Networks from Time-Series Data: Theory and Experiments"

6. **A Banerjee**, J Hart, R Roy, E Ott; American Physical Society (APS) March Meeting, Online; March 19, 2021, “Neuromorphics for Network Inference: New Techniques and Validation in Opto-Electronic Experiments”
7. **A Banerjee**, M Acharyya; American Physical Society (APS) March Meeting, Los Angeles, CA, USA; March 7, 2018, “Spatiotemporal Dynamics of the Kuramoto-Sakaguchi Model with Time-Dependent Connectivity”.

Contributed posters:

1. **A Banerjee**, DJ Pattinson, CL Wincek, P Bunk, SR Chapin, S Navlakha, and HV Meyer; The American Association of Immunologists (AAI) Immunology 2024 (Annual meeting), Chicago, IL, USA; May 4, 2024, “BATMAN: Improved T cell receptor cross-reactivity prediction benchmarked on a comprehensive mutational scan database”
2. **A Banerjee**, DJ Pattinson, CL Wincek, P Bunk, SR Chapin, S Navlakha, and HV Meyer; Gene Expression and Signaling in the Immune System Meeting 2024, Cold Spring Harbor Laboratory, NY, USA; April 17, 2024, “BATMAN: Improved T cell receptor cross-reactivity prediction benchmarked on a comprehensive mutational scan database”
3. **A Banerjee** and M Girvan; 2022 COMBINE Annual Symposium on Network Biology, University of Maryland, College Park, MD, USA; May 13, 2022, “Machine Learning Predicts *C. elegans* Motion from its Neural Firings”
4. **A Banerjee**; American Physical Society (APS) March Meeting, Los Angeles, CA, USA; March 7, 2018, “Dynamical phase transitions in generalized Kuramoto model with distributed Sakaguchi phase”.

Leadership experience:

1. Co-chair, community engagement, Diversity Initiative for the Advancement of STEM (DIAS), Cold Spring Harbor Laboratory (2023-2024).
2. Volunteer and Co-lead, Graduate Resources for Advancing Diversity with Maryland Astronomy and Physics (GRAD-MAP), University of Maryland, College Park (2020-2022).
3. Member, IREAP-ROLE task force on Diversity, Equity, and Inclusion, University of Maryland, College Park (2020-2022).
4. 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).
5. Social Media and Website Management Officer, Women in Physics at the University of Maryland (2019-2020).