

Christopher W. Lynn

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EDUCATION

- Ph.D. in Physics & Astronomy, **University of Pennsylvania** 2020
Advisor: Danielle S. Bassett
GPA: 4.0
- B.A. in Physics (High Honors) and B.A. in Mathematics, **Swarthmore College** 2014

RESEARCH INTERESTS

Statistical mechanics, information theory, network science, computational neuroscience, control theory

RESEARCH EXPERIENCE

- University of Pennsylvania**, Graduate Research Assistant (with Prof. Danielle S. Bassett) 2017 - Present
- Combine ideas from information theory and cognitive science to study how humans learn complex networks and process information.
 - Use maximum entropy models to investigate the emergence of patterns of activity in human populations.
- University of Pennsylvania**, Graduate Research Assistant (with Prof. Daniel D. Lee) 2015 - 2018
- Integrated tools from statistical mechanics and control theory to study how targeted external influence propagates in human populations and Ising networks.
- Fermi National Laboratory**, Lee Teng Fellow (with Dr. Tanaji Sen) 2013 - 2014
- Used principles from condensed matter theory and quantum mechanics to simulate channeling radiation at Fermilab's ASTA photoinjector.
- University of Texas at Austin**, Moncrief Undergraduate Intern (with Prof. Dmitrii E. Makarov) 2012
- Performed large-scale molecular dynamics simulations to probe for self-friction in polymers.
- Swarthmore College**, Undergraduate Research Assistant (with Prof. John Boccio) 2011 - 2012

PUBLICATIONS

Christopher W. Lynn, Eli J. Cornblath, Lia Papadopoulos, Maxwell A. Bertolero, and Danielle S. Bassett. Non-equilibrium dynamics and entropy production in the human brain. Submitted (arxiv.org/abs/2005.02526).

Dale Zhou, **Christopher W. Lynn**, Zaixu Cui, Maxwell Bertolero, Rastko Ciric, Graham L. Baum, Armin Raznahan, Tyler Moore, David Roalf, John Detre, Ruben C. Gur, Raquel E. Gur, Theodore D. Satterthwaite, and Danielle S. Bassett. Efficient coding in the economics of connectomics. In revision ([biorxiv.org/content/10.1101/2020.01.14.906842v2](https://bioRxiv.org/content/10.1101/2020.01.14.906842v2)).

Arian Ashourvan, Preya Shah, Adam Pines, Shi Gu, **Christopher W. Lynn**, Danielle S. Bassett, Katheryn A. Davis, and Brian Litt. A pairwise maximum entropy model uncovers the white matter scaffold underlying emergent dynamics in intracranial EEG. In revision ([biorxiv.org/content/10.1101/507962v1](https://bioRxiv.org/content/10.1101/507962v1)).

Christopher W. Lynn and Danielle S. Bassett. How humans learn and represent networks. Accepted, *Proceedings of the National Academy of Sciences* (arxiv.org/abs/1909.07186).

Lia Papadopoulos, **Christopher W. Lynn**, Demian Battaglia, and Danielle S. Bassett. Relations between large-scale brain connectivity and effects of regional stimulation depend on collective dynamical state. Accepted, *PLOS Computational Biology* (arxiv.org/abs/2002.00094).

Christopher W. Lynn, Lia Papadopoulos, Ari E. Kahn, and Danielle S. Bassett. Human information processing in complex networks. *Nature Physics* (2020).

Christopher W. Lynn, Ari E. Kahn, Nathaniel Nyema, and Danielle S. Bassett. Abstract representations of events arise from mental errors in learning and memory. *Nature Communications* **11** (2020).

Christopher W. Lynn and Danielle S. Bassett. The physics of brain network structure, function, and control. *Nature Reviews Physics* **1** (2019).

Christopher W. Lynn, Lia Papadopoulos, Daniel D. Lee, and Danielle S. Bassett. Surges of collective human activity emerge from simple pairwise correlations. *Physical Review X* **9**, 011022 (2019).

Christopher W. Lynn and Daniel D. Lee. Maximizing Activity in Ising Networks via the TAP Approximation. In *AAAI Conference on Artificial Intelligence* (2018).

Christopher W. Lynn and Daniel D. Lee. Statistical mechanics of influence maximization with thermal noise. *EPL (Europhysics Letters)* **117**, 66001 (2017).

Christopher W. Lynn and Daniel D. Lee. Maximizing Influence in an Ising Network: A Mean-Field Optimal Solution. In *Advances in Neural Information Processing Systems* (2016).

Tanaji Sen and **Christopher Lynn**. Spectral Brilliance of Channeling Radiation at the ASTA Photoinjector. *International Journal of Modern Physics A* **29**, 1450179 (2014).

Ben Blomberg, Daniel Mihalcea, Harsha Panuganti, Philippe Piot, Charles Brau, Bo Choi, William Gabella, Borislav Ivanov, Marcus Mendenhall, **Christopher Lynn**, Tanaji Sen, Wolfgang Wagner. Planned High-Brightness Channeling Radiation Experiment at Fermilab's Advanced Superconducting Test Accelerator. In *International Particle Accelerator Conference* (2014).

HONORS & AWARDS

Understanding Dynamic and Multi-scale Systems Postdoctoral Fellowship, James S. McDonnell Foundation	2019
National Academy of Sciences, Sackler Colloquium Travel Award	2019
APS, Division of Biological Physics Shirley Chan Student Travel Grant	2019
University of Pennsylvania, President Gutmann Leadership Award	2018
University of Pennsylvania, School of Arts and Sciences Graduate Student Government Travel Grant	2018
University of Pennsylvania, Graduate and Professional Student Assembly Research Student Travel Grant	2018
APS, Group on Statistical & Nonlinear Physics Student Speaker Award Winner	2018
APS, Division of Condensed Matter Physics Graduate Student Travel Award	2018
Association for the Advancement of Artificial Intelligence, Student Scholarship	2018
University of Pennsylvania, STEM Pop Talks Competition Winner	2017
Advances in Neural Information Processing Systems, Graduate Travel Award	2016
U Penn Department of Physics and Astronomy, Werner Teutsch Memorial Prize	2015
Swarthmore College, High Honors in Physics	2014
Fermi National Laboratory, Lee Teng Fellowship in Accelerator Science and Engineering	2013
University of Texas at Austin, Moncrief Undergraduate Internship	2012

CONTRIBUTED TALKS

Human information processing in complex networks, <i>APS March Meeting</i>	2020
Human learning and information processing with complex networks, <i>Swarthmore College</i>	2020
The statistical mechanics of human behavior, <i>Center for the Physics of Biological Function, Princeton and CUNY</i>	2020
Quantifying how humans learn and receive information from communication networks, <i>ARL Visit, U Penn</i>	2020
The statistical mechanics of human behavior, <i>Santa Fe Institute</i>	2020
Human learning and information processing with complex networks, <i>Poeppe Group, NYU</i>	2019
Human information processing in complex networks, <i>Computational Linguistics Seminar, U Penn</i>	2019
Human information processing in complex networks, <i>Computational Neuroscience Initiative, U Penn</i>	2019
Human information processing in complex networks, <i>Plotkin Group, U Penn</i>	2019
Structure from noise: Mental errors yield abstract representations of events, <i>APS March Meeting</i>	2019
Structure from noise: Mental errors yield abstract representations of events, <i>Conference on Complex Systems</i>	2018
Surges of collective human activity emerges from simple pairwise correlations, <i>Conference on Complex Systems</i>	2018
Collective human activity emerges from simple pairwise interactions, <i>CompleNet</i>	2018
Collective human activity emerges from simple pairwise interactions, <i>APS March Meeting</i>	2018

Maximizing Activity in Ising Networks via the TAP Approximation, <i>AAAI</i>	2018
Influence Maximization in Ising Networks, <i>APS March Meeting</i>	2017
Influence Maximization in Ising Networks, <i>Center for Brain Science, Harvard University</i>	2017
Simulation of Channeling Radiation in Diamond, <i>Fermi National Laboratory</i>	2013

POSTER PRESENTATIONS

Human information processing in complex networks, <i>Interdisciplinary Advances in Statistical Learning</i>	2019
Structure from noise: Mental errors yield abstract representations of events, <i>Context & Episodic Memory</i>	2019
Human information processing in complex networks, <i>Sackler Colloquium: Brain Produces Mind by Modeling</i>	2019
Mental errors yield abstract representations of events, <i>Emory Theoretical Biophysics Workshop</i>	2019
Structure from noise: Mental errors yield abstract representations of events, <i>CCN</i>	2018
Maximizing Influence in an Ising Network: A Mean-Field Optimal Solution, <i>NIPS</i>	2016

MENTORING & TEACHING EXPERIENCE

<i>Mentor for undergraduate researcher: Mark Choi</i>	2019 – Present
– Studied the structural and informational properties of the knowledge network within a mathematics textbook.	
– Mark is now preparing a first-author publication.	

<i>Mentor for undergraduate researcher: Pranav Iyer</i>	2019 – Present
– Used cognitive models to predict human behavior in a graph learning experiment with an evolving network.	
– Pranav is now preparing a first-author publication.	

Guest Lecturer, University of Pennsylvania:

Network Neuroscience, Department of Bioengineering	2019
Network Neuroscience, Department of Bioengineering	2017

Teaching Assistant, University of Pennsylvania:

Networked Life, Department of Networked and Social Systems Engineering	2015
Principles II (Electricity & Magnetism), Department of Physics and Astronomy	2015
Principles I (Classical Mechanics), Department of Physics and Astronomy	2014

GRANT WRITING

NIH R21 on Computationally-Defined Behaviors in Psychiatry (submitted)

- Extend computational models of human graph learning.
- Relate estimated model parameters to cognitive measures relevant for the treatment of psychiatric disorders.

NSF 20-508 on Biology Integration Institutes (in preparation)

- Investigate how perceived information changes in response to new concepts.
- Design academic lectures to optimally and efficiently communicate complex information.

ACADEMIC & COMMUNITY SERVICE

Referee:

Journal of Complex Networks	2019
IEEE Conference on Decision and Control (CDC)	2017
Advances in Neural Information Processing Systems (NeurIPS)	2016

Member:

American Physical Society (APS)	2016 – Present
Association for the Advancement of Artificial Intelligence (AAAI)	2017 – 2018

<i>Founder & Organizer: Graduate Seminar Series, University of Pennsylvania</i>	2015 - 2018
Led a weekly seminar series for graduate students and postdocs to practice their science communication skills	

<i>Volunteer Instructor: Discovery Summer Camp at the Franklin Institute, Philadelphia, PA</i>	2015 - 2017
Planned and taught weekly science workshops for children	