

Alec Kirkley

P.h.D. Candidate, Department of Physics
University of Michigan

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Education **University of Michigan**

Ph.D., Physics (Expected 2022).

Fields: Complex systems, Network Theory, Statistical Physics

M.S., Physics, 2018.

University of Rochester

B.S. Physics, B.A. Mathematics, 2017.

Summa Cum Laude (top 2% of graduating class)

Publications

Working Papers

1. G. T. Cantwell, **A. Kirkley**, and M. E. J. Newman, The friendship paradox and network structure.
2. G. Li, **A. Kirkley**, D. Krofcheck, and B. Klein, Entropy in mountainous river networks.

Submitted Papers

3. **A. Kirkley**, Information theoretic network approach to socioeconomic correlations (2020).
4. J. Aguilar, A. Bassolas, G. Ghoshal, S. Hazarie, **A. Kirkley**, M. Mazzoli, S. Meloni, S. Mimar, V. Nicosia, J. J. Ramasco, and A. Sadilek, Impact of urban structure on COVID-19 spread. *Preprint arXiv:2007.15367* (2020).
5. S. Feng and **A. Kirkley**[†], Online geolocalized emotion across US cities during the COVID crisis: Universality, policy response, and connection with local mobility. *Preprint arXiv:2009.10461* (2020).
6. **A. Kirkley**, G. T. Cantwell, and M. E. J. Newman, Message passing for probabilistic models on networks with loops. *Preprint arXiv:2009.12246* (2020).

Peer Reviewed Papers

7. A. A. Klishin, **A. Kirkley**, D. J. Singer, and G. van Anders, Robust design from systems physics. *Scientific Reports* **10**, 14334 (2020).
8. S. Feng and **A. Kirkley**[†], Mixing patterns in interdisciplinary co-authorship networks at multiple scales. *Scientific Reports* **10**, 7731 (2020).

9. **A. Kirkley**, G. T. Cantwell, and M. E. J. Newman, Balance in signed networks. *Physical Review E* **99**, 012320 (2019).
10. **A. Kirkley**, H. Barbosa, M. Barthelemy, and G. Ghoshal, From the betweenness centrality in street networks to structural invariants in random planar graphs. *Nature Communications* **9**, 2501 (2018).

† denotes co-first authorship

Awards and Fellowships

National Defense Science and Engineering Graduate (NDSEG) Fellowship
2019-2022 Class of Fellows

National Science Foundation Graduate Research Fellowship (NSF GRFP)
Awarded 2019, but declined for NDSEG Fellowship

University of Michigan Rackham Research Grant
Awarded 2019

Summa Cum Laude, University of Rochester
Awarded in 2017 to top 2% of students in the graduating class

Elected Phi Beta Kappa, University of Rochester
Awarded in 2016 to top 14 of ≈ 1400 juniors in the 2017 graduating class

University of Rochester Physics Honors Prize
Awarded in 2016 to #1 physics junior undergraduate

Conference Contributions

Probabilistic models on networks with loops
NetSci 2020, Online, September 2020.

Balance in signed networks
NetSci 2019, University of Vermont, May 2019.

Academic Workshops

Network Epidemiology in the Time of Coronavirus (Net-COVID)
University of Maryland COMBINE and University of Vermont, Online, April 2020

Complex Networks Winter Workshop
University of Laval and University of Vermont, Quebec City, December 2019

Complex Systems Summer School
Sante Fe Institute, Sante Fe, June 2019

Refereed Journals

Scientific Reports, Journal of Complex Networks,
Humanities and Social Sciences Communications

Invited Lectures	Statistical Physics and Social Systems Foundations of Social Data Science course, University of Hong Kong, January 2020
Other Academic Activities	Detroit Data For Transportation Collaboration Utilized methods in network science and statistical inference to determine at which regions and times of day electric scooters are being ridden dangerously in Detroit Communicated results regularly with city of Detroit to impact local geofencing policy Michigan Data Science Team Utilized time series models to predict future development indicator data for the United Nations Development Goals Challenge, placing 18th out of over 2000 competitors by the challenge deadline Implemented Natural Language Processing models (LSTM neural network, N-gram model) to predict drug ratings given customer reviews
Teaching	Center for the Study of Complex Systems, University of Michigan Teaching Assistant, Network Theory, 2018-2020 Department of Physics, University of Michigan Teaching Assistant, Undergraduate Mechanics, 2017-2018 Department of Physics, University of Rochester Teaching Assistant, Undergraduate Mechanics, 2015 Teaching Assistant, General Physics, 2014 Department of Mathematics, University of Rochester Mathematics Tutor, 2014-2015
Technical Skills	Python, C++, Cython, Bash, Stan, Git Graph algorithms, combinatorial and continuous optimization, statistical physics, bayesian inference, high performance computing, deep learning, data mining, time series analysis, geospatial analysis, natural language processing, web scraping
Relevant Coursework	University of Michigan Statistical Inference, Estimation, and Learning Mining of Large Scale Graph Data Theory of Social and Technological Networks Advanced Condensed Matter Physics: Statistical Field Theory and Critical Phenomena Statistical Physics Quantum Theory I and II University of Rochester Network Science Analytics (graduate level) Data Science I: Modern Statistics (graduate level)

Data Science II: Complexity (graduate level)
Computational Physics
Physics and Finance
Partial Differential Equations and Fourier Analysis
Real Analysis
Abstract Algebra
Advanced Linear Algebra
Game Theory
Intermediate Microeconomics
Intermediate Macroeconomics