Alec Kirkley

P.h.D. Candidate, Department of Physics   akirkley@umich.edu
University of Michigan   https://aleckirkley.com

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. *Preprint arXiv:2009.13825* (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 Univerity 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