Alec Kirkley

P.h.D. Candidate, Department of Physics
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Education

University of Michigan
Ph.D. Candidate, Physics.
Advisor: Mark Newman
Fields: Complex systems, Network Theory, Statistical Physics
M.S., Physics, 2018.

University of Rochester
B.S. Physics, B.A. Mathematics, 2017.
Summa Cum Laude

Publications

Working Papers

10. G. Li, **A. Kirkley**, D. Krofcheck, and B. Klein, Entropy in mountainous river networks.

Papers Under Review

9. **A. Kirkley**†,*, G. T. Cantwell, and M. E. J. Newman, Message passing for probabilistic models on networks with loops. *Preprint arXiv:2009.12246* (2020). In revision at *Science Advances*.

8. 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). In revision at *Nature Communications*.

7. 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). In review at *Scientific Reports*.

6. G. T. Cantwell, **A. Kirkley**, and M. E. J. Newman, The friendship paradox in real and model networks. *Preprint arXiv:2012.03991* (2020). Submitted to *Journal of Complex Networks*.

Peer Reviewed Papers

5. **A. Kirkley**†,*, Information theoretic network approach to socioeconomic correlations. *Physical Review Research* **2**, 043212 (2020).

4. A. A. Klishin, **A. Kirkley**, D. J. Singer, and G. van Anders, Robust design from systems physics. *Scientific Reports* **10**, 14334 (2020).

3. S. Feng and **A. Kirkley**[†,*], Mixing patterns in interdisciplinary co-authorship networks at multiple scales. *Scientific Reports* **10**, 7731 (2020).

2. **A. Kirkley**[†,*], G. T. Cantwell, and M. E. J. Newman, Balance in signed networks. *Physical Review E* **99**, 012320 (2019).

1. **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 first/co-first authorship

∗ denotes corresponding 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 $\sim 1\%$ of 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

Journals Refereed

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

Invited Talks

Information theoretic network approach to socioeconomic correlations
Network Science Institute, Northeastern University, December 2020

Statistical Physics and Social Systems
Foundations of Social Data Science course, University of Hong Kong, January 2020

Other Academic Activities

Michigan Data Informed Cities for Everyone (M-DICE)
Utilized methods in network science and statistical inference to assist in identification of regions for effective scooter geofencing and bike lane construction
Communicated results regularly with city of Detroit to impact local 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