Curriculum Vitae

Alec Kirkley

Contact Information

University of Michigan Department of Physics
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Ann Arbor, MI, 48109, USA

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Education

University of Michigan, Department of Physics — 2018 –
Ph.D Candidate in Physics. Advisor: Mark Newman
Research areas: Network Theory, Urban Science, Statistical Physics

University of Michigan, Department of Physics — 2018
M.S. in Physics

University of Rochester, Department of Physics & Astronomy — 2017
B.S. in Physics and B.A. in Mathematics, *summa cum laude*

Publications

† first/co-first authorship, * corresponding authorship

Working Papers

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

Papers Under Review

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

3. 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*.

4. 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*.

5. 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

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

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).

Funding

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

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

University of Michigan Rackham Research Grant 2019

Awards and Honors

Summa cum laude, University of Rochester 2017
Awarded to top 2% of students in the graduating class across all fields

Phi Beta Kappa, University of Rochester 2016
Awarded to top $\sim 1\%$ of students in the junior class across all fields

University of Rochester Physics Honors Prize 2016
Awarded to top performing junior undergraduate in physics

Teaching Experience

Center for the Study of Complex Systems, University of Michigan 2018–
Teaching Assistant, Network Theory

Department of Physics, University of Michigan 2017–2018
Teaching Assistant, Mechanics

Department of Physics, University of Rochester 2014–2016
Teaching Assistant, Mechanics
Teaching Assistant, Introductory General Physics

Department of Mathematics, University of Rochester 2014–2015
Mathematics Tutor

Technical Skills and Coursework

Languages/frameworks

- Python, C++, Cython, Bash, Stan, Git

Methods

- 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

Courses at 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

Courses at 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

Other Academic Activities

Peer Reviewed Conference Contributions

"Probabilistic Models on Networks with Loops" — September, 2020
Talk, NetSci 2020, Online

"Balance in Signed Networks" — May, 2019
Poster, NetSci 2019, University of Vermont Complex Systems Center

Invited Talks

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

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

Academic Workshops

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

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

Complex Systems Summer School — June, 2019
Santa Fe Institute

Refereed Journals

Scientific Reports
Journal of Complex Networks
Humanities and Social Sciences Communications

Clubs and Organizations

Michigan Data Informed Cities for Everyone (M-DICE) — 2020 –
Utilized methods in network science and statistical inference
to assist in identification of regions for effective scooter geo-fencing
and bike lane construction
Communicated results regularly with city of Detroit to impact local policy

Michigan Data Science Team — 2019 –
Implemented time series models to predict future development indicator data
for the United Nations Development Goals Challenge
Placed 18th out of over 2000 competitors by the challenge deadline
Implemented Natural Language Processing models to predict drug ratings
given customer reviews