

Curriculum Vitae

Keith Burghardt

Contact Information:

Information Sciences Institute,
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General Information:

Education:

- Ph.D. Physics, University of Maryland, College Park, MD. June 2016.
 Thesis advisors: Profs. Michelle Girvan and William Rand
B.S. Physics, University of Maryland, College Park, MD. June 2012.
 Magna Cum Laude with High Honors in Physics
 Undergraduate thesis advisor: Prof. Ho Jung Paik

Professional Experience:

- 2018-Present: Computer Scientist, USC Information Sciences Institute, Marina del Rey, CA
2016-2018: Postdoctoral Researcher, University of California, Davis, CA

Prizes, Awards, and Scholarships

- 2021: ISI Meritorious Service Award
2018: SIAM Travel Award - NS18
2018: International Conference on Computational Social Science (IC2S2)
 Scholarship
2016: ISI Director's Intern Award
2015: Conference on Complex Systems Starred Paper Award
2012-2014: University of Maryland Dean's Fellowship

Research:

Publications:

Articles in Submission:

1. **K. Burghardt**, K. Lerman. (2022). Emergent Instabilities in Algorithmic Feedback Loops. arXiv preprint arXiv:2201.07203.

Journal Publications:

1. Y. He, **K. Burghardt**, K. Lerman. (2022). Leveraging Changepoint Detection to Discover Natural Experiments in Data *EPJ-Data Science* 11(49).
2. M. Abram, **K. Burghardt**, G.V. Steeg, A. Galstyan, R. Dingreville. (2022). Inferring topological transitions in pattern-forming processes with self-supervised learning. *NPJ Computational Materials* 8(205).
3. **K. Burghardt**, J. H. Uhl, K. Lerman, S. Leyk. (2022). Road network evolution in the urban and rural United States since 1900. *Computers, Environment and Urban Systems*, 95: 101803.

4. **K. Burghardt**, S. Guo, K. Lerman. (2021). Unequal impact and spatial aggregation distort COVID-19 growth rates. *Philos. Trans. Royal Soc. A* 380:20210122.
5. **K. Burghardt**, Z. He, A. G. Percus, and K. Lerman. (2021). The emergence of heterogeneous scaling in research institutions. *Communications Physics* 4(189).
6. A. Rao, F. Morstatter, M. Hu, E. Chen, **K. Burghardt**, E. Ferrara, K. Lerman. (2021). Political Partisanship and Anti-Science Attitudes in Online Discussions about Covid-19. *J Med Internet Res* 23(6):e26692.
 - Featured on USCNews and reported in several media sources, including Tribune India, The Tyee, and NBC Miami
7. S.C. Ngo, A. G. Percus, **K. Burghardt**, and K. Lerman. (2020). The Transsortative Structure of Networks. *Proc. R. Soc. A*. 476: 20190772.
8. **K. Burghardt** and Z. Maoz. (2020). Dyadic imbalance in networks. *Journal of Complex Networks* 8(1): cnaa001.
9. **K. Burghardt**, W. Rand, and M. Girvan. (2019). Inferring models of opinion dynamics from aggregated jury data *PLoS One*. 2019;14(7):e0218312.
 - Seen in MIT Technology Review “The Best of the Physics arXiv (Week Ending in November 11)”
10. M. Turalska, **K. Burghardt**, M. Rohden, A. Swami, and R. M. D'Souza. (2019). Cascading failures in scale-free interdependent networks. *Phys. Rev. E* 99(3): 032308.
11. **K. Burghardt** and Z. Maoz. (2018). Partial Shocks on Cooperative Multiplex Networks with Varying Degrees of Noise. *Sci. Rep.* 8(1): 13619.
12. Y. Lin, **K. Burghardt**, M. Rohden, P.-A. Noel, and R. M. D'Souza. (2018). Self-organization of dragon-king failures. *Phys. Rev. E* 98(2): 022127.
13. **K. Burghardt**, E. Alsina, K. Lerman, W. Rand, and M. Girvan. (2017). Myopia of Crowds: A Study of Community Evaluation on Stock Exchange. *PLoS One* 12(3): e0173610.
14. **K. Burghardt**, C. Verzijl, J. Huang, M. Ingram, B. Song and M. Hasne. (2016). Testing Modeling Assumptions in the West Africa Ebola Outbreak *Sci. Rep.* 6: 34598 EP.
15. **K. Burghardt**, W. Rand, and M. Girvan. (2016). Competing Opinions and Stubbornness: Connecting Models to Data *Phys. Rev. E* 93(3): 032305.

Referenced Conference and Workshop Proceedings:

1. M. Schmitz, G. Murić, **K. Burghardt**. (2022). Detecting Anti-Vaccine Users on Twitter. In: *ICWSM 2023* (in press).
2. M. Schmitz, G. Murić, **K. Burghardt**. (2022). Quantifying How Hateful Communities Radicalize Online Users. In: *ASONAM 2022* (in press).
3. Y. He, **K. Burghardt**, S. Guo and K. Lerman. (2022). Learning Fairer Interventions. In: *Proceedings of the 2021 AAAI/ACM Conference on AI, Ethics, and Society* pp. 317–323.
4. S. Guo, **K. Burghardt**, A. Rao and K. Lerman. (2022). Emotion Regulation and Dynamics of Moral Concerns During the Early COVID-19 Pandemic. In: *Proceedings of the 2022 16th International AAAI Conference on Web and Social Media: SocialSens Workshop*.
5. Y. He, Rao A., **K. Burghardt**, K. Lerman. (2021). Identifying Shifts in Collective Attention to Topics on Social Media. In: *SBP-BRIMS 2021. Lecture Notes in Computer Science*, 12720. Springer, Cham.
6. **K. Burghardt**, N. Tavabi, E. Ferrara, S. Narayanan, and K. Lerman. (2021). Having a Bad Day? Detecting the Impact of Atypical Events Using Wearable Sensors. In: *SBP-BRIMS 2021. Lecture Notes in Computer Science*, vol 12720. Springer, Cham.

7. Y. He, C. Tran, J. Jiang, **K. Burghardt**, E. Ferrara, E. Zheleva, K. Lerman. (2021). Heterogeneous Effects of Software Patches in a Multiplayer Online Battle Arena Game. In: *Foundations of Digital Games (FDG) 2021*.
8. T. Santos, **K. Burghardt**, K. Lerman, D. Helic. (2021). Limiting Tags Fosters Efficiency. In: *13th ACM Web Science Conference 2021 (WebSci'21)*, pp. 46-55.
9. **K. Burghardt**, T. Hogg, R. D'Souza, K. Lerman, M. Posfai. (2020). Origins of Algorithmic Instabilities in Crowdsourced Ranking. In: *Proceedings of the ACM on Human-Computer Interaction (CSCW 2020)*, pp. 1-20.
10. T. Santos, **K. Burghardt**, K. Lerman, D. Helic. (2020). Can Badges Foster a More Welcoming Culture on Q&A Boards? In: *Proceedings of the International AAAI Conference on Web and Social Media (ICWSM 2020)* 14: pp. 969-973.
11. Y. He, **K. Burghardt**, K. Lerman. (2020). A Geometric Solution to Fair Representations In: *Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society (AIES 2020)*, pp. 279-285.
12. **K. Burghardt**, T. Hogg, and K. Lerman. (2018). Quantifying the Impact of Cognitive Biases in Question-Answering Systems. In: *Proceedings of the Twelfth International AAAI Conference on Web and Social Media (ICWSM)*, 12(1) pp. 568-571.
13. E. Ferrara, N. Alipoufard, **K. Burghardt**, C. Gopal, K. Lerman. (2017). Dynamics of Content Quality in Collaborative Knowledge Production. In: *Proceedings of the Eleventh International AAAI Conference on Web and Social Media (ICWSM)*, pp. 520-523.
14. T. Agarwal, **K. Burghardt**, K. Lerman. (2017). On Quitting: Performance and Practice in Online Game Play. In: *Proceedings of the Eleventh International AAAI Conference on Web and Social Media (ICWSM)*, 11(1), pp. 452-455.

Book Chapters and Other One-Time Publications:

1. N. Alipoufard, **K. Burghardt**, and K. Lerman. (2021). Disaggregation via Gaussian Regression for Robust Analysis of Heterogeneous Data. In: *Handbook on Computational Social Science Vol 2*. Eds: Uwe Engel, Anabel Quan-Haase, Xun Liu, Lars Lyberg.
2. **K. Burghardt**. (2017). 2017 Conference on Complex Systems Report *SIAM DSWeb* [Online] <https://bit.ly/2VSSTOG>.

Internal Report:

K. Burghardt and M. Girvan. (2013). Clustering Faculty in the Biosciences. *University of Maryland, College Park Internal Report*.

Presentations:

- 2022: Invited seminar talk at Computer Vision for Cultural Heritage SIG at the Turing
Invited talks at the ICWSM SocialSens Workshop, and Symposium of USC-
Amazon Center on Trustworthy AI
- 2021: Invited seminar talk at USC Information Sciences Institute
Invited talks at SBP-BRiMS 2021, AI Futures Symposium (August), Networks
- 2020: Invited talks at GRIDS@USC and NetSci 2020
- 2019: Invited talk at GRIDS@USC
- 2018: Invited seminars at Northeastern; UC Merced; USC Information Sciences
Institute
Invited talks at APS Far West Section Fall Meeting; 4th Annual International
Conference on Computational Social Science; SIAM Workshop on Network
Science; 4th Annual Postdoctoral Research Symposium

- 2017: Invited talks at Conference on Complex Systems, International School and Conference on Network Science (2017)
- 2016: Invited seminar at Information Sciences
Invited talks at GRAD Presentation, Northeastern Presentation
- 2015: Invited talks at Complexity in Business Conference; Conference on Complex Systems; SIAM Workshop on Network Science; Maryland-Mason Meeting
- 2014: Invited talks at Complexity in Business Conference; CAM Graduate Workshop
- 2013: Invited talk at Complexity in Business Conference

Posters:

- 2018: Twelfth International AAAI Conference on Web and Social Media (ICWSM)
Title: “Quantifying the Impact of Cognitive Biases in Question-Answering Systems”
- 2017: 3rd Annual Postdoctoral Research Symposium (2017)
Title: “Cooperation Network Responses to Shocks”
- 2013: Ki-Net Young Researcher Workshop (2013)
Title: “Influence and Rumor Propagation in Equilibrium on Networks”

Grants and Contracts:

- 2022: **Co-PI:** DARPA AIE EMPATH. \$1.0M, Aug.-1-22 – Feb.-23-24
Co-PI: Southern California Center for Chronic Health Disparities in Latino Children and Families Pilot Project for “Analyzing Digital Menu,” \$50K, June-1-22 to May-31-23.
Co-PI: USC ISI Exploratory Research Award for “Why Resilience in Innovation is Necessary and How to Foster It,” \$100K, May-1-22 to May-1-23
- 2021: **PI:** USC-Amazon Center for Secure and Trusted Machine Learning Award for “Fast Fair Decentralized Learning,” \$50K, Sept-1-21 to Sept-30-22
- 2021: **PI:** USC ISI Exploratory Research Award for “Identifying Populations Susceptible to Anti-Science,” \$100K, May-1-21 to May-1-22
- 2021: **Co-PI:** USC ISI Research Award for “FairPRS: Fairly Predicting Genetic Risks for Personalized Medicine,” \$100K, May-1-21 to May-1-22
- 2020: **PI:** Sandia National Laboratories contract for “Unsupervised and Semi-Supervised Inference of Material States,” \$20K, Jan-1-21 to Jun-1-21
- 2019: **Co-PI:** DARPA contract for “Bespoke: Learning bespoke interventions for optimizing performance in heterogenous populations,” HR0011990114, \$1.0M, Jul-23-2019 to May-31-2021

Service:

Professional:

- 2020-present: Co-Organizer of USC CKIDS Student research project
Organizer of Fairness and Bias ISI Internal Seminar Series
- 2022: Co-organizer of the INTERSPEECH Special Session “Inclusive and Fair Speech Technologies”
Session chair of WebConf 2022 Social Network Analysis and Graph Algorithms Track
Judge for ACM TrojanHacks Hackathon; judge for GRIDS MindSpark Hackathon
- 2020-2021: Organizer of USC ISI’s AI Seminar Series

- 2020: Organizer of Summer School on Sensor-Based Behavioral Machine Learning (S3B2-ML)
- 2018: Organizer of UC Davis Complex Systems Working Group
- 2015: Project leader: Santa Fe Institute Complex Systems Summer School Research Project

Reviewing:

- 2022: ICWSM, WSDM, ICDM, SBP-BRiMS, PNAS Nexus, OSNEM, Communications in Nonlinear Science and Numerical Simulation, EPJ Data Science, PLOS ONE, Physical Review E, Frontiers in Public Health, Information and Software Technology, Data in Brief
- 2021: KDD, ICWSM, Nature Communications, Communications Physics, Inf. Process. Manage., OSNEM, Scientific Reports
- 2020: The WebConf (formally WWW), AAAI, KDD, WSDM, CMAME, Proc. Royal Society A, EPJ Data Science, 6G Series IEEE Vehicular Technology Magazine, JSTAT, Inf. Process. Manage., Frontiers in Physics
Panel review: “AI for Decision Support” (DOE)
- 2019: ICWSM, WWW, KDD, WebSci, Frontiers of Big Data, Chaos, CMAME
Proposal review: NSF MMS
- 2018: Scientific Reports, Frontiers of Big Data, Chaos
- 2017: Scientific Reports, PLOS ONE, IEEE Transactions on Computational Social Systems, Phys. Rev. E

Teaching:

- Spring 2022: Co-lecturer DSCI 550 “Data Science at Scale”
- Spring 2021: Co-lecturer DSCI 552 “Machine Learning for Data Science”
- Fall 2019: Co-lecturer INF 553 “Foundations and Applications of Data Mining”