Kai-Cheng Yang

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Education

Ph.D., Informatics, Complex Systems track, Indiana University	Jul. 2022 (expected)
M.S., Theoretical Physics, Lanzhou University (China)	Jun. 2017
B.S., Theoretical Physics, Lanzhou University (China)	Jun. 2014

Honors & Awards

- Selected for Future Leaders Summit 2022, University of Michigan — 2022
- IU Luddy Outstanding Research Award ($500) — 2021
- IU School of Public Health Big Idea Challenge ($250) — 2020
- IU Informatics Ph.D. Student Conference Travel Awards ($1000) — 2020
- IU GISA Conference Travel Awards ($700) — 2019
- IU Informatics Ph.D. Student Conference Travel Awards ($1000) — 2019
- NSF Research Trainee scholarship in Complex Networks and Systems ($5000) — 2018

Research Projects

Social Media

Mining social media data to:

- Reveal the prevalence [J3, W3], dissemination [J15], and real-world implications of online misinformation [R3];
- Detect social bots with machine learning [R1, C2, C3, J12]; study their role [R2] and human perception [J6];
- Probe platform bias [R6, J11];

Public Health

Analyzing large-scale medical claims datasets to:

- Study the opioid epidemic in the US [J4]; estimate the effectiveness of intervention policies [J5]; identify at-risk patients [J1, R4, J13] and high-risk providers [R5];

Network Science

- Propose and evaluate network embedding methods [J7–J9]
- Model spreading phenomenon [J14, J16]

Publications
Google Scholar
Citations: 1,888
H-index: 14
I10-index: 15

Journal Articles

J1. Perry, B. L., Odabas, M., **Yang, K.-C.**, Lee, B., Kaminski, P., Aronson, B., Ahn, Y.-Y., Oser, C. B., Freeman, P. R. & Talbert, J. C. New means, new measures: Assessing prescription drug seeking indicators over ten years of the opioid epidemic. *Addiction* **117,** 195–204 (2022).

J2. **Yang, K.-C.**, Lee, B., Ahn, Y.-Y. & Perry, B. L. Use of and Comorbidities Associated With Diagnostic Codes for COVID-19 in US Health Insurance Claims. *JAMA Network Open* **4,** e2124643 (2021).

J3. **Yang, K.-C.**, Pierri, F., Hui, P.-M., Axelrod, D., Torres-Lugo, C., Bryden, J. & Menczer, F. The COVID-19 Infodemic: Twitter versus Facebook. *Big Data & Society* **8,** 20539517211013861 (2021).

J4. Lee, B., **Yang, K.-C.**, Kaminski, P., Ahn, Y.-Y., Peng, S., Odabas, M., Gupta, S., Green, H. & Perry, B. L. Substitution of Nonpharmacologic Therapy With Opioid Prescribing for Pain During the COVID-19 Pandemic. *JAMA Network Open* **4,** e2138453 (2021).

J5. Lee, B., Zhao, W., **Yang, K.-C.**, Ahn, Y.-Y. & Perry, B. L. Systematic Evaluation of State Policy Interventions Targeting the US Opioid Epidemic, 2007-2018. *JAMA Network Open* **4,** e2036687 (2021).

J6. Yan, H., **Yang, K.-C.**, Menczer, F. & Shanahan, J. Asymmetrical Perceptions of Partisan Political Bots. *New Media & Society* **23,** 3016–3037 (2021).

J7. Yoon, J., **Yang, K.-C.**, Jung, W.-S. & Ahn, Y.-Y. Persona2vec: A Flexible Multi-role Representations Learning Framework for Graphs. *PeerJ Computer Science* **7,** e174 (2021).

J8. Zhang, Y.-J., **Yang, K.-C.** & Radicchi, F. Model-free hidden geometry of complex networks. *Physical Reviews E* **103,** 012305 (2021).

J9. Zhang, Y.-J., **Yang, K.-C.** & Radicchi, F. Systematic comparison of graph embedding methods in practical tasks. *Physical Reviews E* **104,** 044315 (2021).

J10. Pasquetto, I. V., Swire-Thompson, B., Amazeen, M. A., Benevenuto, F., Brashier, N., Bond, R. M., Bozarth, L. C., Budak, C., Ecker, U. K., ... & **Yang, K.-C.** Tackling misinformation: What researchers could do with social media data. *The Harvard Kennedy School (HKS) Misinformation Review* **1** (2020).

J11. Wen, C., Pacheco, D., **Yang, K.-C.** & Menczer, F. Neutral bots probe political bias on social media. *Nature Communications* **12,** 5580 (2020).

J12. **Yang, K.-C.**, Varol, O., Davis, C. A., Ferrara, E., Flammini, A. & Menczer, F. Arming the public with artificial intelligence to counter social bots. *Human Behavior and Emerging Technologies,* e115 (2019).

J13. Perry, B. L., **Yang, K.-C.**, Kaminski, P., Odabas, M., Park, J., Martel, M., Oser, C. B., Freeman, P. R., Ahn, Y.-Y. & Talbert, J. Co-prescription network reveals social dynamics of opioid doctor shopping. *PLoS ONE* **14,** e0223849 (2019).

J14. Zhang, Y.-J., Wu, Z.-X., Holme, P. & **Yang, K.-C.** Advantage of Being Multicomponent and Spatial: Multipartite Viruses Colonize Structured Populations with Lower Thresholds. *Physical Reviews Letters* **123.** (Editors' Suggestion), 138101 (2019).

J15. Shao, C., Ciampaglia, G. L., Varol, O., **Yang, K.-C.**, Flammini, A. & Menczer, F. The spread of low-credibility content by social bots. *Nature Communications* **9,** 4787 (2018).

J16. **Yang, K.-C.**, Wu, Z.-X., Holme, P. & Nonaka, E. Expansion of cooperatively growing populations: Optimal migration rates and habitat network structures. *Physical Reviews E* **95,** 012306 (2017).

Peer-reviewed Conference Proceedings

C1. Torres-Lugo, C., **Yang, K.-C.** & Menczer, F. *The Manufacture of Partisan Echo Chambers by Follow Train Abuse on Twitter* in *(Forthcoming) Proceedings of the International AAAI Conference on Web and Social Media (ICWSM)* (2022).

C2. **Yang, K.-C.**, Varol, O., Hui, P.-M. & Menczer, F. *Scalable and Generalizable Social Bot Detection through Data Selection* in *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)* **34** (New York, NY, USA, 2020), 1096–1103.

C3. Sayyadiharikandeh, M., Varol, O., **Yang, K.-C.**, Flammini, A. & Menczer, F. *Detection of Novel Social Bots by Ensembles of Specialized Classifiers* in *Proceedings of the 29th ACM International Conference on Information & Knowledge Management (CIKM)* (Virtual, 2020), 2725–2732.

Peer-reviewed Workshop/Demo/Dataset/Software Papers

W1. DeVerna, M. R., Pierri, F., Truong, B. T., Bollenbacher, J., Axelrod, D., Loynes, N., Torres-Lugo, C., **Yang, K.-C.**, Menczer, F. & Bryden, J. *CoVaxxy: A Collection of English-Language Twitter Posts About COVID-19 Vaccines* in *Proceedings of the International AAAI Conference on Web and Social Media (ICWSM)* **15** (Virtual, 2021), 992–999.

W2. **Yang, K.-C.**, Aronson, B. & Ahn, Y.-Y. BiRank: Fast and Flexible Ranking on Bipartite Networks with R and Python. *Journal of Open Source Software* **5,** 2315 (2020).

W3. **Yang, K.-C.**, Torres-Lugo, C. & Menczer, F. *Prevalence of Low-Credibility Information on Twitter During the COVID-19 Outbreak* in *Proceedings of the ICWSM International Workshop on Cyber Social Threats (CySoc)* (Virtual, 2020).

W4. Hui, P.-M., **Yang, K.-C.**, Torres-Lugo, C. & Menczer, F. *BotSlayer: DIY Real-Time Influence Campaign Detection* in *Proceedings of the International AAAI Conference on Web and Social Media (ICWSM)* **14** (Virtual, 2020), 980–982.

W5. **Yang, K.-C.**, Hui, P.-M. & Menczer, F. *Bot Electioneering Volume: Visualizing Social Bot Activity During Elections* in *Companion Proceedings of The 2019 World Wide Web Conference (WWW)* (San Francisco, CA, USA, 2019), 214–217.

W6. Hui, P.-M., **Yang, K.-C.**, Torres-Lugo, C., Monroe, Z., McCarty, M., Serrette, B., Pentchev, V. & Menczer, F. BotSlayer: real-time detection of bot amplification on Twitter. *Journal of Open Source Software* **4,** 1706 (2019).

Under review

R1. **Yang, K.-C.**, Ferrara, E. & Menczer, F. Botometer 101: Social bot practicum for computational social scientists. *arXiv:2201.01608* (2022).

R2. Duan, Z., Li, J., Lukito, J., **Yang, K.-C.**, Chen, F., Shah, D. V. & Yang, S. Algorithmic Agents in the Hybrid Media System: Social Bots, Selective Amplification and Partisan News about COVID-19. *Human Communication Research (forthcoming)* (2022).

R3. Pierri, F., Perry, B., DeVerna, M., **Yang, K.-C.**, Flammini, A., Menczer, F. & Bryden, J. Online misinformation is linked to early COVID-19 vaccination hesitancy and refusal. *Scientific Reports (forthcomming); arXiv:2104.10635* (2022).

R4. **Yang, K.-C.**, Aronson, B., Odabas, M., Ahn, Y. Y. & Perry, B. L. Comparing Measures of Centrality in Bipartite Social Networks: A Study of Drug Seeking for Opioid Analgesics. *In submission* (2021).

R5. **Yang, K.-C.**, Lee, B., Kaminski, P., Odabas, M., Ahn, Y.-Y. & Perry, B. L. Association between receiving prescription opioids through high-volume opioid prescribers and adverse outcomes in a commercially insured population, 2015-2019. *In submission* (2021).

R6. **Yang, K.-C.**, Hui, P.-M. & Menczer, F. How Twitter Data Sampling Biases U.S. Voter Behavior Characterizations. *arXiv:2006.01447* (2020).

Tools | **Observatory on Social Media (OSoMe)**
- Botometer® [C3, J12], BotometerLite [C2]: popular bot detection tools with 250,000 daily requests from researchers, journalists, and social media users

- BotSlayer [W4, W6], BEV [W5], Hoaxy®: bot amplification detection & visualization tools with thousands of users
- OSoMeTweet (GitHub, PyPI): Python library for accessing Twitter's V2 API
- CoVaxxy [W1]: dashboard for COVID-19 vaccine Twitter discussion

Network Science

- Persona2vec (GitHub) [J7]: multi-role representations embedding for networks
- BiRank (GitHub, PyPI, CRAN) [W2]: bipartite network PageRank

PRESENTATIONS **Tutorials and Demos**

- Fast and Flexible Ranking on Bipartite Networks with Python and R
  Indiana University Network Institute workshop series   Nov. 2021
- Introduction to Botometer®
  Knight Research Network Tool Demonstration Day (Virtual)   Oct. 2021
- Identifying Social Media Manipulation with OSoMe Tools (video)
  IC^2S^2 2020 (Virtual)   Jul. 2020

Talks

- The COVID-19 Infodemic: prevalence, adverse actors, and real-world impact [R3, J3, W3]
  Future Leaders Summit 2022 (Ann Arbor, USA)   Apr. 2022
- The COVID-19 Infodemic: Twitter versus Facebook [J3]
  Social Media Lab Guest Speaker Series (Virtual)   Oct. 2021
  IC^2S^2 2021 (Virtual)   Jul. 2021
  NetSci 2021 (Virtual)   Jul. 2021
  Computation + Journalism Symposium — C+J 2021 (Virtual)   Feb. 2021
  The 3rd North American Social Networks Conference — NASN 2021 (Virtual) Jan. 2021
- Bipartite Network Centrality Comparison: A Study of Opioid Doctor Shopping [R4]
  IC^2S^2 2020 (Virtual)   Jul. 2020
- Prevalence of Low-Credibility Information on Twitter During the COVID-19 Outbreak [W3]
  CySoc 2020 (Virtual)   Jun. 2020
- BotometerLite [C2]
  IC^2S^2 2020 (Virtual)   Jul. 2020
  AAAI 2020 (New York, USA)   Feb. 2020
- Bot Electioneering Volume [W5]
  CyberSafety 2019 (San Francisco, USA)   May 2019
- Expansion of Cooperatively Growing Populations on Networks [J16]
  Chinese Physical Society Fall Meeting 2016 (Beijing, China)   Sep. 2016

WORKING
EXPERIENCE

TikTok Inc. (ByteDance), CA, USA

   Security engineering intern   Summer 2021

Indiana University, IN, USA

   Research assistant, doctor shopping project   Fall 2018 – Spring 2022

TEACHING
EXPERIENCE

Indiana University, IN, USA

   Mentor, Undergraduate Research Opportunities in Computing
                                                          Spring 2021 – Spring 2022

Indiana University, IN, USA

SERVICE   **Journal Reviewer:** Frontiers in Public Health (2022); Journal of the Royal Society Interface (2022); International Journal of Human-Computer Interaction (2022); PLoS ONE (2022, 2021); Social Network Analysis and Mining (2022, 2020); Political Research Exchange (2021); International Journal of Information Technology & Decision Making (2021); Computers & Security (2021); International Journal of Data Science and Analytics (2021); International Communication Gazette (2021); Big Data & Society (2021); Information, Communication and Society (2021); Online Social Networks and Media (2021); Information Processing & Management (2021); IEEE Transactions on Knowledge and Data Engineering (2020); Humanities & Social Sciences Communications (2020); PeerJ Computer Science (2020); IEEE Internet Computing (2020); ACM Digital Threats: Research and Practice (2020);
Conference Reviewer: CSCW ('22); ICWSM ('20,'21,'22); CIKM ('21);
Workshop Organizer: International Workshop on Cyber Social Threats 2022 (CySoc)

IN THE PRESS   **Selected Media Coverage**

- Using OSoMe tools to track inauthentic actors and spread of misinformation online
  Sky News (Jan. 2022); *AXIOS (May 2021)*; *USA Today (Mar. 2021)*; *IndyStar (Mar. 2021)*; *AXIOS (Feb. 2021)*; *Scientific American (Jan. 2021)*; *Bloomberg News (Nov. 2020)*; *The New York Times (Oct. 2020)*; *Newsweek (Oct. 2020)*; *Bloomberg News (Mar. 2020)*; *The Conversation (Jan. 2020)*; *The National Interest (Nov. 2019)*; *The Conversation (Nov. 2019)*; *IU news (Sep. 2019)*; *IDS news (Sep. 2019)*; *Science Node (Sep. 2019)*; *Reuters (Nov. 2018)*;
- COVID-19 Infodemic on Twitter and Facebook [J3]
  News 5 (Jan. 2022); *The Conversation (Jul. 2021)*;
- Substitution of Nonpharmacologic Therapy With Opioid Prescribing for Pain During the COVID-19 Pandemic [J4]
  Everyday Health (Dec. 2021); *Health Day (Dec. 2021)*;
- Neutral bots probe political bias on social media [J11]
  Futurity (Oct. 2021);
- Systematic evaluation of state policy interventions targeting the US opioid epidemic [J5]
  MedPage Today (Jan. 2022); *U.S. Pharmacist (Mar. 2021)*; *News-Medical (Feb. 2021)*;
- Low-credibility information on Twitter during the COVID-19 outbreak [W3]
  IEEE Spectrum (Jul. 2020);
- Asymmetrical perceptions of partisan political bots [J6]
  IU the Media School Report (Jul. 2020);
- The spread of low-credibility content by social bots [J15]
  Salon (Sep. 2020); *IU news (Nov. 2018)*; *ScienceNews (Nov. 2018)*;

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