

# Kai-Cheng Yang

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CONTACT      Network Science Institute  
INFORMATION   Northeastern University  
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Boston, MA 02115

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Google Scholar

APPOINTMENTS   **Northeastern University**, MA, USA

Postdoctoral Research Associate, Network Science Institute

Aug. 2023 –

**Indiana University**, IN, USA

Research assistant

Aug. 2018 – May 2023

Teaching assistant

Aug. 2017 – May 2018

EDUCATION      **Ph.D.**, Informatics, Indiana University, IN, USA

Jun. 2023

**M.S.**, Theoretical Physics, Lanzhou University, China

Jun. 2017

**B.S.**, Theoretical Physics, Lanzhou University, China

Jun. 2014

RESEARCH      **Current focuses**

INTERESTS

- **Generative AI in social contexts**: enhancing social bots [R1]; combating misinformation [R2, R3];
- **Social media bot**: detection (**Botometer**<sup>®</sup>) [J3, C2, C3, J18]; characterization [J5, W6]; human perception [R5, J13];
- **Misinformation**: prevalence [J1, J9, W4]; dissemination [J21]; real-world impact [J7];

**Past projects**

- **U.S. opioid epidemic**: intervention policy evaluation [J11]; high-risk patients [J2, J6, J19]; impact of COVID-19 [J10];
- **Network science**: embedding [J14–J16]; spreading phenomenon [R4, J20, J22];

HONORS &      IU Informatics Luddy Graduate Research Award (\$500)

2023

AWARDS      IU Luddy Dean's Office Conference Travel Award (\$1,000)

2023

Affiliate, **Center for Information, Technology, and Public Life**, UNC-Chapel Hill

2022

IU GISA Conference Travel Award (\$300)

2022

Best Reviewer Award at AAAI ICWSM 2022

2022

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 Award (\$1,000)

2020

IU GISA Conference Travel Award (\$700)

2019

IU Informatics Ph.D. Student Conference Travel Award (\$1,000)

2019

**NSF Research Trainee scholarship** in Complex Networks and Systems (\$5,000)

2018

PUBLICATIONS   <sup>†</sup>as corresponding author

GOOGLE SCHOLAR   **Journal Articles**

- J1. Pierri, F., DeVerna, M. R., **Yang, K.-C.**, Axelrod, D., Bryden, J. & Menczer, F. One Year of COVID-19 Vaccine Misinformation on Twitter: Longitudinal Study. *Journal of Medical Internet Research* **25**, e42227 (2023).
- J2. **Yang, K.-C.**, Aronson, B., Odabas, M., Ahn, Y.-Y. & Perry, B. L. Comparing measures of centrality in bipartite patient-prescriber networks: A study of drug seeking for opioid analgesics. *PLoS ONE* **17**, e0273569 (2022).
- J3. **Yang, K.-C.**<sup>†</sup>, Ferrara, E. & Menczer, F. Botometer 101: Social bot practicum for computational social scientists. *Journal of Computational Social Science* **5**, 1511–1528 (2022).
- J4. **Yang, K.-C.**<sup>†</sup>, Hui, P.-M. & Menczer, F. How Twitter data sampling biases U.S. voter behavior characterizations. *PeerJ Computer Science* **8**, e1025 (2022).
- J5. 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* **48**, 516–542 (2022).
- J6. 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).
- J7. Pierri, F., Perry, B. L., 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* **12**, 5966 (2022).
- J8. **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).
- J9. **Yang, K.-C.**<sup>†</sup>, 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).
- J10. 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).
- J11. 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).
- J12. Wen, C., Pacheco, D., **Yang, K.-C.** & Menczer, F. Neutral bots probe political bias on social media. *Nature Communications* **12**, 5580 (2021).
- J13. Yan, H., **Yang, K.-C.**, Menczer, F. & Shanahan, J. Asymmetrical Perceptions of Partisan Political Bots. *New Media & Society* **23**, 3016–3037 (2021).
- J14. 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).
- J15. Zhang, Y.-J., **Yang, K.-C.** & Radicchi, F. Model-free hidden geometry of complex networks. *Physical Reviews E* **103**, 012305 (2021).
- J16. Zhang, Y.-J., **Yang, K.-C.** & Radicchi, F. Systematic comparison of graph embedding methods in practical tasks. *Physical Reviews E* **104**, 044315 (2021).
- J17. 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).

- J18. **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).
- J19. 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).
- J20. 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).
- J21. 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).
- J22. **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 Proceedings of the International AAAI Conference on Web and Social Media (ICWSM)* **16** (Atlanta, GA, USA, 2022), 1017–1028.
- C2. **Yang, K.-C.<sup>†</sup>**, 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. Aiyappa, R., DeVerna, M. R., Pote, M., Tran Truong, B., Zhao, W., Axelrod, D., Pessianzadeh, A., Kachwala, Z., Kim, M., Can Seckin, O., Kim, M., Gandhi, S., Manikonda, A., Pierri, F., Menczer, F. & **Yang, K.-C.<sup>†</sup>**. *A Multi-Platform Collection of Social Media Posts about the 2022 U.S. Midterm Elections in Proceedings of the International AAAI Conference on Web and Social Media (ICWSM)* **17** (Limassol, Cyprus, 2023), 981–989.
- W2. 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.
- W3. **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).
- W4. **Yang, K.-C.<sup>†</sup>**, 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).
- W5. 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.
- W6. **Yang, K.-C.<sup>†</sup>**, 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.

- W7. 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.**<sup>†</sup> & Menczer, F. Anatomy of an AI-powered malicious social botnet. *Preprint arXiv:2307.16336* (2023).
- R2. **Yang, K.-C.**<sup>†</sup> & Menczer, F. Large language models can rate news outlet credibility. *Preprint arXiv:2304.00228* (2023).
- R3. DeVerna, M. R., Yan, H., **Yang, K.-C.** & Menczer, F. Artificial intelligence is ineffective and potentially harmful for fact checking. *Preprint arXiv:2308.10800* (2023).
- R4. Xue, L., **Yang, K.-C.**, Cui, P.-B. & Di, Z. Network localization strength regulates innovation diffusion with macro-level social influence. *Preprint arXiv: 2301.00151* (2023).
- R5. Yan, H., **Yang, K.-C.**, Shanahan, J. & Menczer, F. Exposure to social bots amplifies perceptual biases and regulation propensity. *OSF preprint*. <https://doi.org/10.31219/osf.io/ap2qf> (2022).

#### Book chapters

- B1. Yan, H. & **Yang, K.-C.**<sup>†</sup>. *Handbook of Critical Studies of Artificial Intelligence* (ed Lindgren, S.) chap. The landscape of social bot research: a critical appraisal. <https://doi.org/10.31219/osf.io/3cf4j> (Edward Elgar, 2023).

#### Other Works

- O1. **Yang, K.-C.** & Menczer, F. *How many bots are on Twitter? The question is difficult to answer and misses the point*. The Conversation (<https://theconversation.com/how-many-bots-are-on-twitter-the-question-is-difficult-to-answer-and-misses-the-point-183425>). 2022.

#### TOOLS

##### Observatory on Social Media (OSoMe)

- **Botometer**<sup>®</sup> [J3, C3, J18], **BotometerLite** [C2]: bot detection tools handling ~ 250,000 daily requests from researchers, journalists, and social media users; used by Elon Musk's team in his dispute with Twitter (via **CNN**, **BBC**, and **Yahoo! Finance**)
- **BotAmp** [J3]: bot amplification level comparison
- **Midterm 2022 dashboard**: dashboard for US 2022 midterm elections Twitter discussion
- **Hoaxy**<sup>®</sup>: visualization of information spreading online with tens of thousands of users
- **CoVaxxy** [W2]: dashboard for COVID-19 vaccine Twitter discussion

##### Network Science

- **Persona2vec** (**GitHub**) [J14]: multi-role representations embedding for networks
- **BiRank** (**GitHub**, **PyPI**, **CRAN**) [W3]: bipartite network PageRank

#### PRESENTATIONS Tutorials and Demos

- Identifying Social Media Manipulation with OSoMe Tools  
*Computation + Journalism Conference – C+J 2022 (Virtual)* Jun. 2022  
*IC<sup>2</sup>S<sup>2</sup> 2020 (Virtual)* Jul. 2020
- Introduction to **Botometer**<sup>®</sup>  
*Visit by former Dominican Republic president Leonel Fernández (Bloomington, USA)* Apr. 2022  
*Invited demo at the Learning Informatics Lab, University of Minnesota (Virtual)* Mar. 2022  
*Knight Research Network Tool Demonstration Day (Virtual)* Oct. 2021

- Fast and Flexible Ranking on Bipartite Networks with Python and R  
*Indiana University Network Institute workshop series* (Bloomington, USA) Nov. 2021

#### Talks

- LLMs and cyber social threats: Good, bad, and ugly [R1–R3]  
*Invited talk at Workshop on Applications of LLMs in Media* (Beijing, China) Jul. 2023  
*Invited talk at School of Journalism, Fudan University* (Shanghai, China) Jun. 2023
- Fantastic bots and how to find them [J3, R5, J12, J13, W4, C2, C3, J18]  
*Invited talk at Yangtze Delta Region Institute* (Huzhou), University of Electronic Science and Technology of China (Huzhou, China) Aug. 2023  
*Invited talk at International Academic Center of Complex Systems, Beijing Normal University – Zhuhai* (Zhuhai, China) Jul. 2023  
*Invited talk at Summer Institutes in Computational Social Science 2023 – Beijing* (Beijing, China) Jul. 2023  
*Invited talk at New Media Research Center, Beijing Normal University* (Beijing, China) Jul. 2023  
*Invited talk at Social Computing Group, University of Zurich* (Virtual) Feb. 2023  
*Invited talk at Computational Methods Research Group, UW-Madison* (Virtual) Feb. 2023
- The COVID-19 Infodemic: prevalence, adverse actors, and real-world impact [J7, J9, W4]  
*2022 INFORMS Annual Meeting* (Indianapolis, USA) Oct. 2022  
*Invited talk at Computational Social Science Lab at Penn* (Virtual) Jun. 2022  
*Future Leaders Summit 2022* (Ann Arbor, USA) Apr. 2022
- The COVID-19 Infodemic: Twitter versus Facebook [J9]  
*Social Media Lab Guest Speaker Series* (Virtual) Oct. 2021  
*IC<sup>2</sup>S<sup>2</sup> 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 [J2]  
*IC<sup>2</sup>S<sup>2</sup> 2020* (Virtual) Jul. 2020
- Prevalence of Low-Credibility Information on Twitter During the COVID-19 Outbreak [W4]  
*CySoc 2020* (Virtual) Jun. 2020
- BotometerLite [C2]  
*IC<sup>2</sup>S<sup>2</sup> 2020* (Virtual) Jul. 2020  
*AAAI 2020* (New York, USA) Feb. 2020
- Bot Electioneering Volume [W6]  
*CyberSafety 2019* (San Francisco, USA) May 2019

#### INDUSTRY

**Analysis Group**, MA, USA

#### EXPERIENCE

Consultant for the trial of Elon Musk vs. Twitter

Aug. 2022 – Oct. 2022

**TikTok Inc. (ByteDance)**, CA, USA

Security engineering intern

May 2021 – Aug. 2021

#### TEACHING

**Indiana University**, IN, USA

#### EXPERIENCE

Guest lecturer, INFO-T100 Social Media Manipulation 101

Fall 2022

**Indiana University**, IN, USA

Associate instructor, INFO-I590 Applied Data Science

Fall 2017, Spring 2018

## SERVICE

**Guest Editor:** EPJ Data Science: Special Issue on Computational Approaches for Cyber Social Threats;

**Conference Organizer:** Publicity chair @ 18th International AAAI Conference on Web and Social Media (ICWSM24);

**Workshop Organizer:** International Workshop on Cyber Social Threats 2023 (CySoc) @ WebConf23; International Workshop on Cyber Social Threats 2022 (CySoc) @ ICWSM22;

**Journal Reviewer:**

- **Interdisciplinary:** PNAS (23); Scientific Reports (22, 23); PLoS ONE (21-23); Royal Society Open Science (22); Journal of the Royal Society Interface (22);
- **Computer/information sciences:** Nature Machine Intelligence (23); ACM Computing Surveys (23); ACM Digital Threats: Research and Practice (21); Behaviour & Information Technology (23); Big Data & Society (21); Computers & Security (21); Decision Support Systems (22); EPJ Data Science (23); IEEE Internet Computing (21); IEEE Transactions on Knowledge and Data Engineering (21); IEEE Transactions on Network Science and Engineering (23); Information Processing & Management (21); International Journal of Data Science and Analytics (21); International Journal of Human-Computer Interaction (22); International Journal of Information Technology & Decision Making (21); Journal of Computational Social Science (22); Online Social Networks and Media (21, 22); PeerJ Computer Science (20, 22); Progress in Artificial Intelligence (23); Social Network Analysis and Mining (21, 22);
- **Social sciences:** New Media & Society (23); HKS Misinformation Review (23); Humanities & Social Sciences Communications (21-23); Telematics and Informatics (23); Information, Communication and Society (21); International Communication Gazette (21); Political Research Exchange (21); Socius (22);
- **Health:** Journal of Medical Internet Research (22, 23); BMC Digital Health (23); Frontiers in Public Health (22); JMIR Infodemiology (22, 23); JMIR Public Health and Surveillance (22);

**Conference Reviewer:** CSCW (22, 23); CIKM (21-23); ICWSM (20-22); WebSci (22); WebConf (22);

## IN THE PRESS

### Selected Quotations and Interviews

- **Social media in general:** *Reuters* (Jul. 2023); *The Verge* (May 2023); *TechCrunch* (Feb. 2023); *CNN* (Feb. 2023); *Tech Policy Press* (Feb. 2023);
- **Social bots and other inauthentic actors on social media:** *WIRED* (Sep. 2022); *WIRED* (Sep. 2022); *BBC* (Aug. 2022); *Ars Technica* (Aug. 2022); *Yahoo! Finance* (Aug. 2022); *CNN* (Aug. 2022); *Yahoo! Finance* (Aug. 2022); *CNN* (Jun. 2022); *The Wall Street Journal* (Jun. 2022); *The Washington Post* (May 2022); *Politico* (May 2022); *Business Insider* (May 2022); *Yahoo! News* (May 2022); *Spectrum News* (Apr. 2022);
- **Online misinformation:** *WISH-TV* (Sep. 2022); *IEEE Spectrum* (Jul. 2020);

### Selected Media Coverage of My Works

- **AI-powered social bots [R1]:** *Wired* (Aug. 2023); *Mashable* (Aug. 2023); *Business Insider* (Aug. 2023); *MIT Technology Review* (Aug. 2023); *Tech Policy Press* (Aug. 2023);
- **Using AI to combat misinformation [R2]:** *RStreet* (Aug. 2023);
- **Botometer® [C3, J18] & BotAmp:** *Forbes* (Aug. 2023); *The Washington Post* (Jun. 2023); *Business Insider* (May 2023); *i* (May 2023); *The Hill* (May 2023); *Vice* (Apr. 2023); *PEN America* Mar. 2023; *ABC Action News* (Jan. 2023); *Poder360* (Jan. 2023); *Newsweek* (Dec. 2022); *Business Insider* (Nov. 2022); *The Daily Star* (Nov. 2022); *USA Today* (Oct. 2022); *Daily Maverick* (Oct. 2022); *CNN* (Oct. 2022); *The Washington Times* (Sep. 2022); *The Economic Times* (Sep. 2022); *CNN* (Sep. 2022); *Quotidiano Nazionale* (Aug. 2022); *The Guardian* (Aug.

- 2022); *The National Interest* (Aug. 2022); *The Verge* (Aug. 2022); *Yahoo! Finance* (Aug. 2022); *CNN* (Aug. 2022); *CNBC* (Aug. 2022); *Washington Examiner* (Aug. 2022); *Engadget* (Aug. 2022); *The Washington Post* (Aug. 2022); *The New York Times* (Aug. 2022); *Inc. Magazine* (Aug. 2022); *Newsweek* (Aug. 2022); *Snopes* (Jul. 2022); *USA Today* (Jun. 2022); *Slate* (Jun. 2022); *Forbes* (Jun. 2022); *Wired* (May 2022); *The Washington Post* (May 2022); *Los Angeles Times* (Apr. 2022);
- **CoVaxxy [W2]:** *Washington Examiner* (Jun. 2023); *The New York Times* (May 2022); *AP News* (Dec. 2021); *USA Today* (Mar. 2021);
  - **Online misinformation is linked to early COVID-19 vaccination hesitancy and refusal [J7]:** *The Hill* (Feb. 2023); *Global Citizen* (Aug. 2022); *Medical News Today* (Aug. 2022); *Time* (May 2022); *News-Medical* (May 2022); *Tech Policy Press* (Apr. 2022); *Slate* (Apr. 2022);
  - **Neutral bots probe political bias on social media [J12]:** *The Hill* (Feb. 2023); *NBC News* (Apr. 2022); *Metro* (Apr. 2022); *Rolling Stone* (Apr. 2022);
  - **COVID-19 Infodemic on Twitter and Facebook [J9]:** *News 5* (Jan. 2022); *The Conversation* (Jul. 2021);
  - **Substitution of Nonpharmacologic Therapy With Opioid Prescribing for Pain During the COVID-19 Pandemic [J10]:** *Clinical Pain Advisor* (Jan. 2022); *Everyday Health* (Dec. 2021); *Health Day* (Dec. 2021);
  - **Systematic evaluation of state policy interventions targeting the US opioid epidemic [J11]:** *MedPage Today* (Jan. 2022); *U.S. Pharmacist* (Mar. 2021); *News-Medical* (Feb. 2021);
  - **Hoaxy®:** *MakeUseOf* (Jan. 2023); *MIT Technology Review* (Dec. 2022); *Media Matters for America* (Dec. 2022); *The Conversation* (Oct. 2022); *Bloomberg* (Nov. 2020); *NBC News* (Feb. 2020);

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