Research Report

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Dr. Li Bicheng, or How China Learned to Stop Worrying and Love Social Media Manipulation

Insights into Chinese Use of Generative AI and Social Bots from the Career of a PLA Researcher

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About This Report

As the Chinese Party-state engages in more social media manipulation, public interest has grown in understanding Chinese intent and activities. However, much of the public understanding is based on measuring the *outputs* of Chinese behavior, focusing on what Chinese Party-state-affiliated actors are saying and doing on foreign social media. This report provides new insights into Chinese social media manipulation by exploring the Chinese *inputs* of strategy, operational planning and capability development. Specifically, the report provides the first technical description and analysis of Chinese military-affiliated research to improve understanding of the Chinese Party-state's approach to social media manipulation.

The research reported here was completed in July 2024 and underwent security review with the sponsor before public release.

National Security Research Division (NSRD)

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Summary

Despite the Chinese Communist Party's (CCP's) initial fear about the threat that the rise of social media posed for authoritarian regimes, the CCP has come to embrace social media as a way to influence domestic and foreign public opinion in its favor. Even as Beijing blocks foreign social media platforms, such as Facebook and Twitter (now X), from operating in China, it actively seeks to leverage these and other platforms for both overt propaganda and covert influence operations abroad. While Chinese social media manipulation has so far produced relatively limited results, we argue the advent of generative artificial intelligence (AI) could dramatically improve China's capabilities moving forward, posing a greater threat to global democracies.

Issue

The vast majority of research into Chinese social media manipulation focuses on the *outputs* of Chinese behavior to understand what Chinese Party-state-affiliated actors are saying and doing on foreign social media. However, this type of research is inherently retrospective and incomplete because it can only analyze what has already occurred and has been attributed to Beijing. This report contributes to public understanding of the Chinese Party-state's foreign social media manipulation by exploring the *inputs* of Chinese strategy, operational planning, and capability development and looking forward to the potential implications of generative AI for Chinese social media manipulation.

Approach

This report leverages extensive original Chinese-language open-source primary materials to better understand how the Chinese military approaches social media manipulation. Specifically, we focus on Li Bicheng, a Chinese military-affiliated researcher, to understand how the Chinese military has conceptualized and operationalized its approach to cyber-enabled influence operations. We argue Li is, at minimum, an exemplar case study of China's efforts to embrace social media manipulation and, quite possibly, the Chinese military's leading expert on the topic and an advocate of leveraging AI to run large-scale networks of social bots to artificially influence foreign public opinion. We use Li's Chinese-language and English-language publications, as well as patents and other biographical and research funding information, to understand his research agenda. We also provide a technical evaluation of Li's research to compare it with Western state-of-the-art research. To place Li in the broader context of Chinese military efforts, we supplement this with additional Chinese-language research into other Chinese military and broader Party-state researchers and English-language secondary sources.

Key Findings

- The Chinese military likely began developing its social media manipulation capabilities by the mid-2010s and almost certainly began employing them by 2018.
- The Chinese military is clearly interested in leveraging AI for social media manipulation, and at least some Chinese military researchers conduct cutting-edge work.
- The Chinese military and broader Party-state are likely well-placed to adopt generative AI for social media manipulation, including to run social bots for large-scale efforts.
- The Chinese military justifies its social media manipulation efforts in part based on a threat perception that the United States is seeking to undermine the CCP regime.

Recommendations

- The United States and other global democracies should prepare for AI-driven social media manipulation by pursuing these four lines of effort:
  - **adopting risk-reduction measures**, such as social media companies redoubling efforts to combat fake accounts, to restrict the potency of AI-driven efforts
  - **promoting media literacy and government trustworthiness**, such as supporting blockchain or watermarking technology to distinguish authentic content, to limit the impact of AI-driven efforts
  - **increasing public reporting**, such as an annual report on foreign activity, to strengthen confidence in U.S. elections
  - **increasing diplomatic coordination,** especially with Taiwan, to share lessons learned and best practices.
- The U.S. government should conduct an independent, comprehensive evaluation of its information efforts and ensure that the benefits outweigh the costs.
- The U.S. government should consider engaging with Beijing on restricting AI-driven influence operations.
- The U.S. policy community would benefit from additional research on better understanding
  - the People's Republic of China's whole-of-government cooperation on social media manipulation
  - the United Front Work Department as a social media manipulation actor
  - the technical approach of other Party-state actors
  - Party-state cooperation with Chinese companies for social media manipulation.

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Chapter 1. Introduction

In the spring of 2016, Li Bicheng, a computer science professor, left the technology-focused Information Engineering University (IEU) in Zhengzhou, China, and moved to the language- and culture-focused Huaqiao University in Quanzhou, China. But Li is no ordinary academic, and this was no ordinary midcareer job change. Li Bicheng is a Chinese military researcher who, we argue, is likely the People's Liberation Army's (PLA's) top expert on social media manipulation and at least partly responsible for overseeing its operationalization of this capability since the mid-2010s.

Additional details on Li's move help explain this significance. IEU is a part of the PLA Cyberspace Force (PLACSF), which is responsible for the PLA's cyber, electronic warfare, and core foreign influence operations.[1] Huaqiao University is affiliated with China's United Front Work Department (UFWD), which is responsible for much of China's interpersonal influence operations for both domestic and foreign target audiences.[2] This also means that Li officially appears to have retired from his military service in the PLA and become a nominally civilian academic at Huaqiao, although plenty of evidence suggests Li has maintained his PLA ties. For the purposes of this report, we consider him to still be a PLA-affiliated researcher.

This report explores the career and research trajectory of Li Bicheng as a representative microcosm of how the Chinese military entered into the business of foreign social media manipulation, with a special focus on leveraging artificial intelligence (AI) and the adoption of large-scale networks of social bots (automated accounts). We use extensive Chinese-language sources from Li and others to shed new light on how the Chinese military conceptualizes, plans, and seeks to develop capabilities and operational concepts for foreign social media manipulation across strategic, operational, and tactical levels, as well as from a technological perspective. We also intend this report to serve as a useful case study for how the PLA operationalizes nonkinetic capabilities from basic research to applied research to deployment. Finally, we explore how recent technological advances with generative AI may further improve Chinese social media manipulation, considered here in terms of further realizing Li's vision for an AI-driven social media manipulation system (described in Chapter 4).

This report also comes in the context of greater concern in the United States and global democracies about Chinese malign influence activities, including foreign election interference

[1] Specifically, IEU is the main research organization under the PLACSF, previously the PLA Strategic Support Force's (PLASSF's) Network Systems Department (NSD).

[2] For more on UFWD, see Anne-Marie Brady, "Magic Weapons: China's Political Influence Activities Under Xi Jinping," Wilson Center, 2017a; Alex Bowe, *China's Overseas United Front Work: Background and Implications for the United States*, U.S.-China Economic and Security Review Commission, August 2018.

via social media. For example, the Office of the Director of National Intelligence's (ODNI's) 2024 annual worldwide threat assessment said that "Beijing is expanding its global covert influence posture to better support the CCP's [Chinese Communist Party's] goals," including against the United States, and that specifically "TikTok accounts run by a PRC [People's Republic of China] propaganda arm reportedly targeted candidates from both political parties during the U.S. midterm election cycle in 2022."[3] The report added that "China is demonstrating a higher degree of sophistication in its influence activity, including experimenting with generative AI."

This stands in stark contrast to Beijing's public statements on the matter, which consistently reject accusations of any foreign meddling.[4] An October 2023 PRC Ministry of Foreign Affairs (MFA) proposal for a "Global AI Governance Initiative" even went so far as to say Beijing opposes "using AI technologies for the purposes of manipulating public opinion, spreading disinformation, intervening in other countries' internal affairs, social systems, and social order, as well as jeopardizing the sovereignty of other states."[5] This report therefore also stands as open-source documentation of Beijing's lies on this count.[6]

Research Approach and Scope

This report uses extensive, original open-source Chinese-language primary sources to understand how China thinks about and plans for social media manipulation. We center our research on one Chinese military-affiliated researcher, Li Bicheng. We reviewed Li's publicly available works, totaling more than 220 Chinese-language articles in PRC domestic academic journals (as of late 2023) and more than 20 English-language articles for international conferences. We also reviewed published research that uses grant funding Li has received but that he did not author to better understand the whole sweep of research he has overseen. We supplemented this focus on Li with a broader survey of Chinese military writings on relevant topics.

These Chinese texts were assessed for authoritativeness based on a range of factors. These include the author's affiliation (for example, the PLA's Academy of Military Science [AMS] or PLA IEU), venue of publication (e.g., *China Military Science*, *National Defense Technology*), government research funding (e.g., from the Chinese military or the National Social Science Fund [NSSF]), and publication content, among other factors. While this is certainly not an exact

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[3] ODNI, *Annual Threat Assessment of the U.S. Intelligence Community*, February 5, 2024, p. 12.

[4] Ben Blanchard, "China, Asked About U.S. Election Interference, Says Does Not Interfere in Other Countries' Affairs," Reuters, September 19, 2018; MFA, "Qin Gang Refutes the Fallacy that China Tries to 'Interfere' in the Canadian Election," March 3, 2023b.

[5] MFA, "Global AI Governance Initiative," October 20, 2023c.

[6] Nathan Beauchamp-Mustafaga, "Biden Should Call China's Bluff on Responsible AI to Safeguard the 2024 Elections," *RAND Blog*, November 14, 2023b.

science, we are confident that the overall body of literature we have leveraged for this report is representative of broader Chinese military thinking and provides useful insights into these topics. Unless otherwise indicated, all translations are those of the authors. We use *China*, *Beijing*, *CCP*, *Party-state*, and *Chinese government* interchangeably to refer to the CCP-run PRC government.

The open-source nature of this report inherently leaves open the possibility that there are other Chinese military researchers who have an equal or potentially larger role in designing and operationalizing the Chinese military's approach to social media manipulation but who do not publish openly on the topic. However, we argue that most military programs, even those that are secretive, ultimately rely on open-source research and require some amount of public coordination across a large bureaucracy and that this equally applies for the Chinese military.[7] At a minimum, Li stands as a credible exemplar for how the Chinese military approaches this topic.

It is important to note that social media manipulation is only one of many tools within the CCP's broader foreign influence operations toolkit and that the Chinese military is only one of likely many actors conducting these activities on behalf of the Party-state.[8] We limit our research here mostly to Chinese military efforts and Chinese-language open-source materials. We did not conduct original analysis of China-attributed social media manipulation activities but did review recent reports on the topic. Additional research into how other parts of the Chinese government (such as the MFA, UFWD, and Propaganda Department) and Chinese private-sector companies support Chinese social media manipulation would be equally beneficial to better understand a broader range of Chinese Party-state-affiliated actors.[9]

Note that this report was drafted before the dissolution of the PLASSF in April 2024.[10] The PLASSF has now been broken up into its constitute parts as independent services and arms of the PLA, creating the new Aerospace Force, CSF, and Information Support Force. By all accounts,

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[7] For two good examples of open-source research into secret Chinese government programs, see Andrew Erickson, *Chinese Anti-Ship Ballistic Missile (ASBM) Development: Drivers, Trajectories, and Strategic Implications*, Jamestown Foundation, 2013; Andreas Rupprecht, "The PLA Air Force's 'Silver-Bullet' Bomber Force," *China Brief*, July 21, 2017.

[8] For reviews of the Party-state's broader toolkit, see U.S.-China Economic and Security Review Commission, "China's Global Influence and Interference Activities," hearing, March 23, 2023; Ben Blanchard, "Taiwan Says China Has 'Very Diverse' Ways of Interfering in Election," Reuters, October 4, 2023. For a review of known Party-state actors involved in social media manipulation, see Albert Zhang, Tilla Hoja, and Jasmine Latimore, *Gaming Public Opinion: The CCP's Increasingly Sophisticated Cyber-Enabled Influence Operations*, Australian Strategic Policy Institute, 2023.

[9] Bilva Chandra and Lev Navarre Chao, "Dismantling the Disinformation Business of Chinese Influence Operations," *RAND blog*, October 17, 2023.

[10] "PLA's Information Support Force Is Brand-New Strategic Arm: Defense Spokesperson," Xinhua, April 19, 2024. For analysis, see Joe McReynolds and John Costello, "Planned Obsolescence: The Strategic Support Force In Memoriam (2015–2024)," *China Brief*, April 26, 2024; J. Michael Dahm, "A Disturbance in the Force: The Reorganization of People's Liberation Army Strategic Support Force," *China Brief*, April 26, 2024; Matt Bruzzese and Peter Singer, "Farewell to China's Strategic Support Force. Let's Meet Its Replacements," Defense One, April 28, 2024. For more on the PLASSF, see Joe McReynolds and John Costello, *China's Strategic Support Force: A Force for a New Era*, National Defense University, 2018.

the PLASSF's information warfare and influence operations components, previously under the NSD, should remain intact under the new PLACSF. Although there is no specific reporting yet on Base 311 or the PLA's IEU, they should similarly follow suit. Overall, the reorganization is unlikely to dramatically change the missions and activities of the PLA's information operation (IO) actors as covered in this report.

Finally, China is one of many countries that conduct social media manipulation, but it is among the most concerning to the U.S. government.[11] Russia is certainly the best known for its efforts, although Iran, North Korea and others also do it. Some democracies do as well, such as India.[12] Some activity has also been attributed by independent researchers to the U.S. government.[13]

Literature Review

There has been much research into the Chinese government's efforts to manipulate foreign social media, but this research usually focuses on understanding the *outputs* of China's efforts. There is much less research into China's strategy, especially its operational and technical approaches.

In terms of China's activity on foreign social media platforms that is publicly acknowledged—for example, Chinese Party-state propaganda outlet accounts on Twitter and Facebook—the German Marshall Fund Alliance for Securing Democracy's Hamilton 2.0 dashboard provides a useful aggregation and analysis of ongoing PRC activity in near real time.[14] In terms of China's covert or otherwise unacknowledged efforts, reporting over the years from the Australian Strategic Policy Institute (ASPI), Mandiant (Google), Graphika, Microsoft, and others has provided good insights into the key narratives the Party-state is seeking to propagate.[15] However, because this analysis relies mostly (although not solely) on public

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[11] For one U.S. government roundup, see ODNI, 2024.

[12] Gerry Shih, "Inside the Vast Digital Campaign by Hindu Nationalists to Inflame India," *Washington Post*, September 26, 2023c; Gerry Shih, Clara Ence Morse, and Pranshu Verma, "Covert Indian Operation Seeks to discredit Modi's Critics in the U.S.," *Washington Post*, December 10, 2023.

[13] See, for example, Graphika and the Stanford Internet Observatory Cyber Policy Center, *Unheard Voice: Evaluating Five Years of Pro-Western Covert Influence Operations*, August 2022; Joel Schectman and Christopher Bing, "Exclusive: Trump Launched CIA covert Influence Operation Against China," Reuters, March 14, 2024; Christopher Bing and Joel Schectman, "Pentagon Ran Secret Anti-Vax Campaign to Undermine China During Pandemic," Reuters, June 14, 2024.

[14] Alliance for Securing Democracy, "Hamilton 2.0 Dashboard," webpage, undated.

[15] Zhang, Hoja, and Latimore, 2023. For reports on those targeting U.S. for political interference, see Alden Wahlstrom, Jess Xia, Alice Revelli, and Ryan Serabian, "Information Operations Targeting 2022 U.S. Midterm Elections Include Trolling, Narratives Surrounding Specific Races, Politicians," Mandiant, December 19, 2022; Microsoft Threat Intelligence, *Same Targets, New Playbooks: East Asia Threat Actors Employ Unique Methods*, April 4, 2024; Graphika, *The #Americans: Chinese State-Linked Influence Operation Spamouflage Masquerades as U.S. Votes to Push Divisive Narratives Ahead of 2024 Election*, September 2024.

attribution and the related provision of data from takedowns by social media platforms, this type of research is inherently a postmortem accounting and deductive analysis of PRC efforts. Public reporting from Google (owner of YouTube), Meta (owner of Facebook and Instagram), Twitter (now X), and OpenAI (owner of ChatGPT), often serves as the foundational public research on these issues.[16] Investigative journalism can also provide new information.[17]

There is some research into how the Party-state is currently thinking about its broader foreign influence strategy.[18] A March 2023 hearing hosted by the congressionally mandated U.S.-China Economic and Security Review Commission on "China's Global Influence and Interference Activities" provided a recent roundup.[19] Additionally, Devin Thorne has explored how the CCP propaganda apparatus is considering leveraging AI (as of 2020) for propaganda and then how it is better tailoring foreign propaganda to target audiences.[20] Samantha Hoffman has explored how the CCP is undertaking extensive data collection to fuel its propaganda efforts.[21] John Chen has also addressed how the Chinese military's cyber capabilities are leveraging AI, including some on influence operations.[22]

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[16] For the most recent, see Zak Butler, "Google Disrupted Over 10,000 Instances of DRAGONBRIDGE Activity in Q1 2024," Google, June 26, 2024; Margarita Franklin, Lindsay Hundley, Mike Torrey, David Agranovich, and Mike Dvilyanski, "Adversarial Threat Report," Meta, May 2024; OpenAI, "Disrupting Deceptive Uses of AI by Covert Influence Operations," May 30, 2024b.

[17] See, for example, Nicholas Confessore, Gabriel J. X. Dance, Richard Harris, and Mark Hansen, "The Follower Factory," *New York Times*, January 27, 2018; Decision of the Central Committee of the Communist Party; Jeff Kao and Mia Shuang Li, "How China Built a Twitter Propaganda Machine Then Let It Loose on Coronavirus," ProPublica, March 26, 2020; Raymond Zhong, Aaron Krolik, Paul Mozur, Ronen Bergman, and Edward Wong, "Behind China's Twitter Campaign, a Murky Supporting Chorus," *New York Times*, June 8, 2020; Paul Mozur, Raymond Zhong, Aaron Krolik, Aliza Aufrichtig, and Nailah Morgan, "How Beijing Influences the Influencers," *New York Times*, December 13, 2021; Jeff Kao, Raymond Zhong, Paul Mozur, Aliza Aufrichtig, Nailah Morgan, and Aaron Krolik, "'We Are Very Free': How China Spreads Its Propaganda Version of Life in Xinjiang," *New York Times*, June 22, 2021.

[18] James Jiann Hua To, *Qiaowu: Extra-Territorial Policies for the Overseas Chinese*, Brill, 2014; Brady, 2017a; Samantha Hoffman, *Engineering Global Consent: The Chinese Communist Party's Data-Driven Power Expansion*, Australia Policy Research Institute, 2019; Alex Joske, *The Party Speaks for You: Foreign Interference and the Chinese Communist Party's United Front System*, Australian Strategic Policy Institute, June 2020; Paul Charon and Jean-Baptiste Jeangène Vilmer, *Chinese Influence Operations: A Machiavellian Moment*, Institute for Strategic Research, October 2021.

[19] U.S.-China Economic and Security Review Commission, 2023.

[20] Devin Thorne, "AI-Powered Propaganda and the CCP's Plans for Next-Generation 'Thought Management,'" *China Brief*, Vol. 20, No. 9, May 15, 2020a; Devin Thorne, *1 Key for 1 Lock: The Chinese Communist Party's Strategy for Targeted Propaganda*, Recorded Future, September 28, 2022b.

[21] See, for example, Hoffman, 2019; Samantha Hoffman and Nathan Attrill, *Mapping China's Tech Giants: Supply Chains & the Global Data Collection Ecosystem*, Australian Strategic Policy Institute, June 2021; Samantha Hoffman, Tilla Hoja, Yvonne Lau, and Lilly Min-Chen Lee, *Truth and Reality with Chinese Characteristics*, Australian Strategic Policy Institute, May 2024.

[22] John Chen, "China's Cyber Capabilities: Warfare, Espionage, and Implications for the United States," hearing, testimony before the U.S.-China Economic and Security Review Commission, February 17, 2022.

By contrast, much less research has focused on how the Chinese Party-state explicitly thinks about foreign social media manipulation. Previous research by one of the authors has explored how the Chinese military thinks about social media broadly, and then also specifically how the Chinese military's primary operational unit for foreign influence operations, Base 311, considered and planned for social media manipulation for election interference against Taiwan in 2018.[23] Additionally, a June 2023 RAND report by one of the authors explored how the PLA is considering leveraging emerging technology, including AI and information technology, for next-generation psychological warfare, including via social media.[24] Most recently, a September 2023 RAND report explored the implications of generative AI for social media manipulation, with a special focus on China's potential future employment against Taiwan.[25]

The U.S. government is also providing more information in this space. The U.S. Department of Defense (DoD)'s annual China Military Power report to Congress provides some high-level details on Chinese influence operations, and the U.S. Department of State's Global Engagement Center released a report in September 2023 surveying Chinese influence efforts.[26] ODNI's annual Worldwide Threat Assessment has included more information in recent years, and the National Intelligence Council (NIC) declassified a report in December 2023 on foreign election interference in the U.S. 2022 midterm elections.[27]

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[23] Nathan Beauchamp-Mustafaga and Michael S. Chase, *Borrowing a Boat Out to Sea: The Chinese Military's Use of Social Media for Influence Operations*, Johns Hopkins University, School of Advanced International Studies, Foreign Policy Institute, 2019; Nathan Beauchamp-Mustafaga and Jessica Drun, "Exploring Chinese Military Thinking on Social Media Manipulation Against Taiwan," *China Brief*, Vol. 21, No. 7, April 2021; Scott W. Harold, Nathan Beauchamp-Mustafaga, and Jeffrey W. Hornung, *Chinese Disinformation Efforts on Social Media, RAND Corporation*, RR-4373/3-AF, 2021; Jackson Smith and Nathan Beauchamp-Mustafaga, "PLA Social Media Warfare and the Cognitive Domain," *China Brief*, September 8, 2023. For more on Base 311, see Mark Stokes and Russell Hsiao, *The People's Liberation Army General Political Department: Political Warfare with Chinese Characteristics*, Project 2049 Institute, October 2013; and Charon and Vilmer, 2021.

[24] Nathan Beauchamp-Mustafaga, *Chinese Next-Generation Psychological Warfare: The Military Applications of Emerging Technologies and Implications for the United States*, RAND Corporation, RR-A853-1, 2023a.

[25] William Marcellino, Nathan Beauchamp-Mustafaga, Amanda Kerrigan, Lev Navarre Chao, and Jackson Smith, *The Rise of Generative AI and the Coming Era of Social Media Manipulation 3.0: Next-Generation Chinese Astroturfing and Coping with Ubiquitous AI*, RAND Corporation, PE-A2679-1, September 2023. For related testimony to Congress, see Nathan Beauchamp-Mustafaga, *Exploring the Implications of Generative AI for Chinese Military Cyber-Enabled Influence Operations: Chinese Military Strategies, Capabilities, and Intent*, RAND Corporation, CT-A3191-1, 2024.

[26] Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China*, U.S. Department of Defense, 2023; Global Engagement Center, *How the People's Republic of China Seeks to Reshape the Global Information Environment*, U.S. Department of State, September 2023.

[27] For the most recent, see ODNI, 2024; NIC, *Foreign Threats to the 2022 U.S. Elections*, declassified on December 11, 2023.

Report Outline

Chapter 2 provides a broader history of the Party-state's evolution from fear of to falling in love with foreign social media manipulation. Chapter 3 provides a biographical overview of Li's career and research trajectory. Chapter 4 addresses Li's core vision for an AI-driven social media manipulation system. Chapter 5 provides a technical evaluation of his research compared with Western state-of-the-art research, and also considers what generative AI may do for Li's vision. Chapter 6 surveys other aspects of Li's wide-ranging research for additional insights. Chapter 7 surveys other PLA and broader Party-state views of social bots as a comparative case study for Li's research. Chapter 8 concludes with some findings from our research and recommendations for the U.S. government and broader policy and research communities.

Chapter 2. How China Fell in Love with Foreign Social Media Manipulation

While many began paying attention to the Chinese Party-state's use of foreign social media over the past several years through its brash *wolf warrior diplomacy* messaging or through public takedowns of its covert accounts, Beijing's journey to loving foreign social media manipulation began long before. Previous research by one of the authors has documented how the PLA's views quickly evolved from seeing social media as purely a threat in the late 2000s, into early recognition by at least some PLA researchers of the potential for offensive capabilities by 2011, and then to broader interest in the mid-2010s and to development and employment by at least 2018, if not earlier.[28] This chapter explores more of the broader Party-state's evolving thinking on the topic, with an emphasis on Party leadership guidance and selective case studies of other Party-state actors, coupled with evidence of Chinese real-world behavior.

Fear and Loathing in Beijing

Social media's ability to spread messages critical of governments and mobilize people to protest or even to overthrow them quickly caught the attention of the Chinese government and Chinese strategic thinkers. First came domestic protests, such as unrest in Tibet in 2008 (ahead of Beijing hosting its first Olympics) and in Xinjiang in 2009, both minority regions that garner extra attention from Chinese leadership because of concerns about regime control. Then came the Arab Spring revolutions over the early 2010s, which saw mass protests and the overthrow of several Middle Eastern governments, as well as continued protests in China that were fueled by social media—the "Jasmine Revolution" and the Wenzhou train crash, both in 2011, among others.[29] This early wave of events paved the way for the Party to first respond in fear, then eventually realize and seize the opportunity to shape domestic and foreign public opinion via social media.

The Party's first response to social media was its default reaction to most things it does not understand or control—a crackdown. Building on its efforts to control the internet, the Party blocked access to Facebook, Twitter, and YouTube in 2009, in the wake of the Xinjiang unrest.[30]

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[28] Beauchamp-Mustafaga and Chase, 2019.

[29] Josh Chin, "Weibo Watershed? Train Collision Anger Explodes Online," *Wall Street Journal*, July 26, 2011; Charlie Custer, "The Wenzhou Crash and the Future of Weibo," *Tech in Asia*, August 1, 2011; Helen Gao, "Rumor, Lies and Weibo: How Social Media is Changing the Nature of Truth in China," *The Atlantic*, April 16, 2012. For a retrospective, see James Griffiths, "Weibo's Free-Speech Failure," *The Atlantic*, March 20, 2019.

[30] These sites were blocked intermittently before July 2009 but were permanently blocked after that. See, for example, Lucy Hornby, "China Blocks Twitter Service Ahead of Anniversary," Reuters, June 2, 2009.

They also implemented tighter control of domestic social media in earnest in 2013, with concerted efforts continuing through the rest of the decade.[31] The Chinese leadership, first under Hu Jintao and then even more ferociously under Xi Jinping, also began a wide-ranging and top-down ideological strengthening campaign, highlighted in the leaked Document 9 from April 2013, approved by the Chinese leadership, which was essentially an official Party screed against Western ideas and sought to bolster Party control over Chinese public discourse.[32] The document specifically argued that

> [c]onfronting the very real threat of Western anti-China forces and their attempt at carrying out Westernization, splitting, and "Color Revolutions," and facing the severe challenge of today's ideological sphere, all levels of Party and Government, especially key leaders, must pay close attention to their work in the ideological sphere and firmly seize their leadership authority and dominance.

Turning to online discourse, it instructed that "[w]e must persist in correct guidance of public opinion . . . strengthen guidance of public opinion on the Internet, purify the environment of public opinion on the Internet."[33]

For the Chinese government, the Arab Spring was only the latest iteration of Western (mainly U.S.)–led efforts to overthrow authoritarian regimes.[34] The Soviet Union's collapse in 1991 was of course the most high profile, but the color revolutions of the early 2000s in Eastern Europe also caught the attention of the Chinese leadership.[35] The difference for the Arab Spring

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[31] Keith B. Richburg, "China's 'Weibo' Accounts Shuttered as Part of Internet Crackdown," *Washington Post*, January 3, 2013; Chris Buckley, "Crackdown on Bloggers Is Mounted by China," *New York Times*, September 10, 2013b; Josh Chin and Paul Mozur, "China Intensifies Social-Media Crackdown," *Wall Street Journal*, September 19, 2013; "Closing Time? China's Social Media Crackdown Has Hit Weibo Hard," Tea Leaf Nation, January 31, 2014. For a broader look at the role of the internet in Chinese society in the 2010s, see Liz Carter, *Let 100 Voices Speak: How the Internet Is Transforming China and Changing Everything*, I.B.Tauris, 2015; Jacques deLisle Avery Goldstein, and Guobin Yang, eds., *The Internet, Social Media, and a Changing China*, University of Pennsylvania Press, 2016. For a broader look at China's propaganda and media strategy in the early Xi years, see Rogier Creemers, "Cyber China: Upgrading Propaganda, Public Opinion Work and Social Management for the Twenty-First Century," *Journal of Contemporary China*, Vol. 26, No. 103, 2016.

[32] "Document 9: A ChinaFile Translation," ChinaFile, November 8, 2013.

[33] "Document 9: A ChinaFile Translation," 2013.

[34] Indira A.R. Lakshmanan, "Leaders in Beijing Feared Arab Spring Could Infect China," Bloomberg, May 1, 2012.

[35] David Shambaugh, *China's Communist Party: Atrophy and Adaptation*, University of California Press, 2008; Ben Blanchard and Sui-Lee Wee, "China Names Conservative, Older Leadership," Reuters, November 15, 2012; Chris Buckley, "Vows of Change in China Belie Private Warning," *New York Times*, February 14, 2013a; Chris Buckley and Steven Lee Myers, "In Turbulent Times, Xi Builds a Security Fortress for China, and Himself," *New York Times*, August 6, 2022; Zhuoran Li, "The CCP's Changing Understanding of the Soviet Union's Collapse," *The Diplomat*, October 8, 2022. For a PLA view, see Lan Zhouda [兰舟达] and Ma Jianguang [马建光], "New Cyber Warfare from the Perspective of Command of the Mind: Taking the Color Revolutions as an Example" ["制脑权视野下的新型网络战: 以颜色革命为例"], *National Defense Technology* [国防科技], April 2015. For a PLA view on the U.S. role in the collapse of the Soviet Union from an ideological perspective, see PLA National Defense University (NDU) film, *Silent Contest* (较量无声), film, 2013; a partial transcript is available in "Silent Contest," China Scope, March 5, 2014.

was the fact that social media platforms—run by U.S. companies that were unambiguously pro-democracy—were one of the main driving forces for the rapid spread of protest momentum. While PRC scholars are less explicit about the impact of domestic Chinese discontent on the Chinese government's approach to social media, Party discussions are very clear about the threat they saw from the Arab Spring.[36] As a *PLA Daily* article said in 2016,

> in the Jasmine Revolution and the Arab Spring, we witnessed Western military powers' skillful use of "online psychological warfare" [网络攻心战] and the great influence of the internet to achieve their political and military goals without making a sound . . . if we don't occupy the online public opinion positions [网络舆论阵地], our opponents will.[37]

The Party leadership itself has apparently taken an interest in social media, making these perceived attacks personal and acute. As one foreign expert summarized,

> [t]he Arab Spring-inspired protests of early 2011 led to profound concern about the use of social media to destabilize the regime. Reports about the private wealth of Party leaders' families, published in foreign media, spread rapidly on Weibo. Online discussion about political tensions became rife in the tumultuous run-up to the 18th Party Congress and the Bo Xilai affair, culminating in rumors about an attempted military coup in Beijing.[38]

For example, the *Washington Post* reported in 2021 that

> a Beijing-based analyst who works for a unit reporting to China's Central Propaganda Department . . . said they were once tasked with producing a data report on how negative content relating to Beijing's senior leadership is spread on Twitter, including profiles of individual academics, politicians and journalists.[39]

This was not the first time; the Chinese government is rumored to have hacked Google in 2010 on the orders of the Chinese leadership because a Politburo member Googled his name and did not like the search results.[40]

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[36] See, for example, Creemers, 2016; Raymond Zhong and Paul Mozur, "For the U.S. and China, a Technology Cold War That's Freezing Over," *New York Times*, March 23, 2018; Christian Shepard and Eva Dou, "Xi Jinping's Quest for Total Control of China Is Just Getting Started," *Washington Post*, October 5, 2022; Nectar Gan and Selina Wang, "A Sense of Crisis Has Defined Xi's Rule. It Will Shape China Well into the Future," CNN, October 14, 2022.

[37] Zhao Xihua [赵熙华], "Online Influence Power Is Combat Power" ["网络影响力就是战斗力"], *PLA Daily*, August 12, 2016, via Ken Moriyasu, "China's Rulers See Social Media as a Theater of Battle," *Nikkei Asia*, September 15, 2016.

[38] Creemers, 2016.

[39] Cate Cadell, "China Harvests Masses of Data on Western Targets, Documents Show," *Washington Post*, December 31, 2021.

[40] John Hudson, "Was China's Politburo Behind the Google Cyber Attacks?" *The Atlantic*, November 29, 2010.

Phase 1, 2013–2016: Renewing Zeal for Propaganda, Especially Online Propaganda, with Trickle-Down Jumpstart to Foreign Social Media

The initial jumpstart for CCP engagement on foreign social media appears to have occurred in 2013–2014, based on publicly available information about high-level Xi Jinping guidance and the first known PRC efforts at social media manipulation.[41] Under the leadership of General Secretary Xi Jinping, the PRC has undertaken a concerted effort to improve its ability to influence foreign audiences, significantly building on efforts begun by his predecessors.[42] This endeavor has been characterized by steps to expand, codify, and institutionalize the means by which the PRC uses its instruments of state power to achieve broader influence abroad. As early as 2013, the CCP Central Committee released planning documents that called for relevant Party organs to "strengthen [their] international communication capabilities and construct foreign discourse power" [加强国际传播能力和对外话语体系建设].[43] Throughout the mid-2010s, China's leadership sought to formulate normative and theoretical guidance for how to accomplish this mission. Xi also oversaw a massive reorganization of China's foreign propaganda apparatus.[44] As one foreign expert on China's propaganda system put it, "this reconfiguration created a centralized and integrated institutional framework for information technologies, in support of an ambitious agenda to place digital technologies at the heart of propaganda, public opinion and social control work."[45]

Specifically, Xi's speech to the National Propaganda and Ideology Work Conference [全国宣传思想工作会议] in August 2013 was likely the call to action, although it follows earlier efforts by predecessor Hu Jintao.[46] While the full version of Xi's speech was never officially

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[41] For earlier Party guidance in response to the Arab Spring, see Perry Link, "The Secret Politburo Meeting Behind China's New Democracy Crackdown," *China File*, February 20, 2011. For broader considerations of Chinese propaganda strategy, see Elsa Kania, "The Party's 'Hurdles': the Internet, Propaganda, and Power," *The Diplomat*, September 27, 2017; Damien Ma and Neil Thomas, "In Xi We Trust: How Propaganda Might Be Working in the New Era," Marco Polo, September 12, 2018.

[42] For two analyses that include the Hu Jintao era, see Elizabeth Bachman, *Black and White and Red All Over: China's Improving Foreign-Directed Media*, CNA Corporation, August 2020; Creemers, 2016.

[43] "Decision of the Central Committee of the Communist Party of China on Several Major Issues Concerning Comprehensively Deepening Reform" ["中共中央关于全面深化改革若干重大问题的决定"], Xinhua, November 15, 2013.

[44] Merriden Varrall, "Behind the News: Inside China Global Television Network," webpage, Lowy Institute, January 10, 2020; Patricia Nilsson, Sun Yu, and Michael Peel, "Behind the Scenes at China TV: Soft Power and State Propaganda," *Financial Times*, June 19, 2021.

[45] Creemers, 2016.

[46] For a review of Hu's efforts, see Bachman, 2020. For the Xinhua summary of Xi's speech, see "Xi Jinping Emphasized at the National Propaganda and Ideological Work Conference that We Should Keep the Overall Situation in Mind, Grasp the General Trend, Focus on Major Issues, and Strive to Do a Better Job in Propaganda and Ideological Work; Liu Yunshan Attended the Meeting and Delivered a Speech" ["习近平在全国宣传思想工作会

published, it was leaked to overseas media several months later.[47] In this speech, Xi called for improving PRC propaganda and, ultimately, ideological control, mostly focused on the Chinese domestic population but also with some consideration for global audiences. He specifically called for "launching a public opinion struggle" [开展舆论斗争], that is, taking a more proactive and combative approach to winning hearts and minds, and focusing more on "telling China's story well" [讲好中国故事] and spreading "positive propaganda" [正面宣传], that is, spreading pro-CCP narratives.[48] This included placing the "highest priority" on online public opinion and focusing on "new media" [新媒体], that is, online media, which by that time very likely included social media, and to specifically "build a strong cyber army" [强大网军]. Xi said that the Party must

> adapt to the new situation of the continuous advancement of social informatization [会信息化], accelerate the integrated development of traditional media and emerging media, and make full use of new technologies and new applications to innovate new media communication methods, so as to occupy the commanding heights of information dissemination" [占领信息传播制高点].

Xi also specifically included a focus on "foreign propaganda" [对外宣传, or 外宣], after arguing that the West is hypocritical in denouncing propaganda but doing more than anyone else and that the West was "badmouthing" China. Xi said,

> [t]he pattern of international public opinion is that the West is strong and we are weak [西强我弱]. The major Western media hold sway over [左右着] world public opinion. We often have reasons but cannot express them, or we cannot spread them after we have said them. This problem must be solved with great efforts. [We] must meticulously and properly conduct external propaganda, innovating external propaganda methods, working hard to create new concepts, new categories and new expressions that integrate the Chinese and the foreign, telling China's story well, communicating China's voice well.[49]

This speech was quite a call by Xi for the rest of the Party to step up its game for propaganda, both domestic and foreign, and to engage more actively in online discussions. The

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议上强调胸怀大局把握大势着眼大事 努力把宣传思想工作做得更好, 刘云山出席会议并讲话"], Xinhua, August 20, 2013. For analysis, see Qian Gang, "Parsing the 'Public Opinion Struggle,'" China Media Project, September 24, 2013.

[47] For one reported transcript of Xi's speech, see Xi Jinping, "The Full Text of Xi Jinping's Speech on August 19 Was Circulated Online: 'Dare to Catch, Dare to Regulate, and Dare to Show the Sword'" ["网传习近平 8•19 讲话全文：言论方面要敢抓敢管敢于亮剑"], China Digital Times, November 4, 2013. Additional details also came in overseas reporting: Cary Huang and Keith Zhai, "Xi Jinping Rallies Party for Propaganda War on Internet," *South China Morning Post*, September 4, 2013.

[48] People's Daily Editorial Board [人民日报编委会], "A Scientific Guide to Consolidating and Strengthening Mainstream Ideology and Public Opinion" ["巩固壮大主流思想舆论的科学指南"], *People's Daily*, August 30, 2013.

[49] Translation partly via "Telling China's Story Well," China Media Project, April 16, 2021.

Party bureaucracy paid close attention and immediately recognized that Xi also wanted the Party propaganda apparatus to care about online discussions, very likely including social media. As one article by the head of Xinhua put it, "Newly emerging public opinion positions . . . have already become the chief battleground in the public opinion struggle, and their importance and status in the overall news and propaganda framework are ever more obvious."[50] The PLA was also quick to pick up on the speech, publishing at least three articles on Xi's speech in the weeks after, including revealing some of its previously undisclosed themes in a signed commentary a couple days later.[51] After all, the language of "public opinion struggle," while little used within mainstream CCP policy circles until Xi's speech, was already a concept embraced by the PLA.[52] Reinforcing how important this 2013 speech was, the five-year anniversary in 2018 was celebrated by Party-state media, and some PLA research specifically cites the 2013 speech as guidance.[53]

The Party propaganda apparatus, very likely in response to Xi's August 2013 speech and broader efforts, became more active on foreign social media soon after. Some in China were already realizing the offensive potential for social media in these early years. As early as 2011, PLA researchers saw the "potential" for offensive psychological warfare in Facebook and Twitter, and identified such advantages as improving content tailoring via user data and shaping

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[50] Li Congjun [李从军], "Firmly Grasping the Initiative in Public Opinion Work" ["牢牢掌握舆论工作主动权"], *People's Daily*, September 4, 2013, via Qian Gang, "Parsing the "Public Opinion Struggle," China Media Project, September 24, 2013.

[51] PLA General Political Department [解放军总政治部], "Conscientiously Study and Implement the Spirit of General Secretary Xi's Important Speech at the National Propaganda and Ideological Work Conference" ["认真学习贯彻习总书记在全国宣传 思想工作会议上的重要讲话精神"], *PLA Daily*, August 22, 2013; Chen Hua [陈华], "Seize the Initiative in the Online Public Opinion Struggle" ["夺取网络舆论斗争的主动权"], *PLA Daily*, September 4, 2013; "We Must Be as Ruthless as We Were in Shangganling on the Field of Ideological Struggle" ["要像坚守上甘岭那样铆在意识形态斗争的阵地上"], *PLA Daily*, September 18, 2013. For broader analysis, see Qian Gang, "Parsing the "Public Opinion Struggle," China Media Project, September 24, 2013.

[52] For earlier PLA usage of public opinion struggle, see, for example, Wang Mingliang [王明亮], "An Analysis of the Features of Information Warfare" ["信息化战争特征简析"], *China Military Science* [中国军事科学], January–February 2005; Wang Lin [王林] and Wang Yitao [王逸涛], "A Study of the Strategy of Cultural Effect in Media [Public Opinion] Struggles" ["舆论较横中文化致效的策略探析"], *China Military Science* [中国军事科学], November–December 2005; Wang Lianshui [王连水] and Ni Heliang [倪合良], "Military Soft Power in the Field of Vision to Win lnformationalized Wars" ["打赢信息化战争视阐中的军事软实力"], *China Military Science* [中国军事科学], March–April 2008; Pu Duanhua [濮端华], "An Analysis of China's Public Opinion Strategy in the Diaoyu Islands Dispute" ["钓鱼岛争端中的我舆论斗争策略探析"], *Military Correspondent* [军事记者], October 2012.

[53] David Bandurski, "Signals from Xi's Speech on Ideology," China Media Project, August 23, 2018. For another analysis highlight its importance, see Ma and Thomas, 2018. For one PLA example, see Ma Lu [马璐], "Research on the Guidance of Military Online Public Opinion in the New Era" ["新时代军队网络舆论引导研究"], master's thesis, National Defense University of Technology [国防科技大学], 2022.

public opinion via "opinion leaders" [意见领袖].[54] Already by this time, pro-CCP content was flooding domestic Chinese social media; U.S. research found that, by at least 2014, the Chinese government was injecting upwards of 448 million inauthentic posts per year, via perhaps as many as 2 million paid commentators, informally known as the 50 cent party [五毛党].[55]

Although the first reports of Chinese disinformation surfaced in 2012 concerning suspected pro-China posts about Tibet on Twitter, the first real wave came in 2014.[56] Most notably, during protests in Hong Kong in June 2014, suspected pro-China accounts on Twitter began spreading disinformation, although in very small numbers and little noticed at the time.[57] But there were more events in 2014, all focused on countering either CCP critics abroad or responding to foreign government accusations about China.[58] This inauthentic behavior was also accompanied by Party-state media very likely purchasing fake followers to boost their official accounts on Western social media by at least May 2014, although some outlets had opened accounts on Facebook and Twitter by 2009 (and this influence buying continued through at least 2019).[59] This 2013–2014 timing is also borne out for the PLA; PLA interest in social media spiked in 2014.[60] However, CCP efforts were still meek in these years; a 2017 study found that the most well-known example from this time frame, pro-China criticism of newly elected Taiwan president Tsai Ing-wen in early 2016, was by all appearances self-organized by Chinese netizens, not the Chinese government (although Beijing did applaud the effort).[61]

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[54] Wu Yinsheng [吴银胜] and Mei Jianbing [梅建兵], "Some Inspirations Drawn from the Application of the Booming Social Media in Psychological Warfare ["社交媒体的迅猛发展及心理战运用的几点启示"]," *National Defense Technology* [国防科技], May 2011.

[55] Gary King, Jennifer Pan, and Margaret E. Roberts, "How the Chinese Government Fabricates Social Media Posts for Strategic Distraction, Not Engaged Argument," *American Political Science Review*, Vol. 111, No. 3, 2017.

[56] Bryan Krebs, "Twitter Bots Target Tibetan Protests," Krebs on Security, March 20, 2012; Adam Segal, "China's Twitter War," *Asia Unbound* blog, Council on Foreign Relations, March 22, 2012; Adam Segal, "China's Twitter-Spam War Against Pro-Tibet Activitsts," *The Atlantic*, March 23, 2012. This activity continued into 2014 and beyond: Andrew Jacobs, "It's Another Perfect Day in Tibet," *New York Times*, July 22, 2014; Jonathan Kaiman, "Free Tibet Exposes Fake Twitter Accounts by China Propagandists," *The Guardian*, July 22, 2014.

[57] Bethany Allen, *Beijing Rules: How China Weaponized Its Economy to Confront the World*, HarperCollins, 2023.

[58] Allen, 2023.

[59] Tom Grundy, "Did China's State-Run News Agency Purchase Twitter Followers?" *Hong Kong Free Press*, April 14, 2015; Alexa Olesen, "Where Did Chinese State Media Get All Those Facebook Followers?" *Foreign Policy*, July 7, 2015. For later reporting, see Confessore et al., 2018; "China's Propaganda Machine Is Spending Over $1 Million to Buy Influence on Foreign Social Media," Quartz, August 21, 2019; Ma Lap-hak, Pan Jiaqing, and Fok Leung-kiu, "Chinese State Media Hire Digital Firms to Boost Followers on Facebook, Twitter," Radio Free Asia, August 22, 2019, trans. by Luisetta Mudie.

[60] Harold, Beauchamp-Mustafaga, and Hornung, 2021.

[61] Nicholas J. Monaco, "Computational Propaganda in Taiwan: Where Digital Democracy Meets Automated Autocracy," working paper, Computational Propaganda Research Project, June 2017. See also Harold, Beauchamp-Mustafaga, and Hornung, 2021.

Xi kept up this focus on propaganda and even had personal awareness of and interest in social media by at least 2015. That December, he visited the offices of *PLA Daily* and sent a holiday message to PLA troops.[62] Shortly after, at the February 2016 Party News and Public Opinion Work Conference [党的新闻舆论工作座谈会], Xi called for developing specific performance benchmarks, goals, and standards to further "promote international communication capability building" [推进国际传播能力建设], noting that the work had entered a period of systemization [系统化].[63] That same month, Xi visited Party-state media to reiterate that their job was to "tell China's story well" and build "flagship media with strong international influence."[64] During that visit, he reportedly "watched with great interest Xinhua News Agency's robot writing system [机器人写稿系统], . . . Xinhua Silk Road Database, . . . [and] overseas social media."[65] Reflecting broader concerns about the risks of ideological poisoning through social media, Xi told Russian media in July 2017 that "violent terrorist ideas continue to spread around the world through the internet and social media, and their deep-seated impact will continue to emerge."[66] Although Xi's specific remarks on social media strategy have been limited, the Party clearly understands that Xi's broader guidance also applies to social media.[67] A 2018 book summarizing Xi's thoughts on the media argued that "we must actively use overseas social media platforms to innovate discourse systems and expression methods to enhance the influence, communication and penetration of overseas social media."[68]

The PLA was attuned to this and working to follow Xi's lead. Responding to Xi's February 2016 call for the Party to better guide domestic and international public opinion, the PLA held a

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[62] "Chairman Xi Inspected the PLA Daily Press, Wished Officers and Troops Happy New Year" ["习主席视察解放军报社向广大官兵祝贺新年"], *China Military Online* [中国军网], December 25, 2015.

[63] "General Secretary Xi Jinping's Important Speech at the Party's Press and Public Opinion Work Symposium Aroused Strong Response" ["习近平总书记在党的新闻舆论工作座谈会上的重要讲话引起强烈反响"], Xinhua, February 20, 2016. For one PLA analysis, see Geng Lei [耿磊], "Build a Strategic Communication System with Clear Chinese Characteristics" ["构建具有鲜明中国特色的战略传播体系"], *Military Correspondent*, May 31, 2021. For a good roundup of Xi's public comments on the topic, see "Xi Jinping Talks About Vigorously Strengthening News and Public Opinion Work" [习近平谈大力加强新闻舆论工作], Party Building Online [党建网], December 10, 2021.

[64] Ben Blanchard and Michael Martina, "China's Xi Urges State Media to Boost Global Influence," Reuters, February 19, 2016.

[65] "Breathe with the Party and the People, and Progress with the Times" ["与党和人民同呼吸, 与时代共进步"], *People's Daily*, February 21, 2016.

[66] "Xi Jinping Accepts an Interview with Russian Media" ["习近平接受俄罗斯媒体采访"], Xinhua, July 3, 2017.

[67] Xi was specifically including social media as part of his propaganda strategy by 2019. See "Xi Jinping: Accelerate the Development of Media Integration and Build an All-Media Communication Pattern" ["习近平: 加快推动媒体融合发展 构建全媒体传播格局"], *Seeking Truth*, March 15, 2019.

[68] *Speeches on Xi Jinping's Media Thought (2018 Version)* [习近平新闻思想讲义 (2018 年版)], People's Press [人民出版社], 2018.

conference in June 2016, with CMC approval, and the *PLA Daily* summary of the meeting stated that the

> functional departments of the Central Military Commission have focused on strengthening positive online propaganda and guidance [网上正面宣传引导], responding to major military-related public opinions, carrying out online military-related ecological governance, and promoting online public opinion capacity building.[69]

Clearly, Xi was driving the Party toward improved propaganda, both foreign and domestic.

Phase 2, 2017–2018: Early Experimentation for Foreign Social Media Manipulation

Xi and the Party leadership kept up the emphasis on improving Beijing's ability to shape foreign discussion and views of China, and the broader Party-state bureaucracy began delivering on this mission. In Xi's work report to the October 2017 19th Party Congress, he called for the Party to "attach great importance to the construction and innovation of communication means, and improve the communication, as well as the guidance, influence and credibility of news and public opinion."[70] This specifically included "strengthen[ing] the construction of internet content [互联网内容建设], establish[ing] a comprehensive network governance system, and creat[ing] a clean and bright cyberspace . . . and clearly oppose and resist all kinds of wrong views."

Xi reinforced these points at the April 2018 National Cybersecurity and Informatization Work Conference. He told the conference, "We must strengthen online positive propaganda, unequivocally adhere to the correct political direction and the guidance of public opinion," and "advance innovation in online propaganda ideas, concepts, forms, methods, measures, etc.; grasp these with timeliness and efficiency; build concentric circles online and offline; generate better social cohesion and consensus."[71] Xi also linked CCP control of online public opinion with CCP regime security:

> we can absolutely not let the internet become a platform for the dissemination of harmful information, or where rumors spread that create trouble . . . without cybersecurity, there is no national security, the economy and society will not

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[69] Kuang Dazhen [匡大镇] and Hong Wenjun [洪文军], "The Military and Civilians Work Together to Promote the Innovative Development of Military Online Public Opinion Work" ["军地携手推进军队网络舆论工作创新发展"], *PLA Daily*, June 28, 2016.

[70] "Full Text of Xi Jinping's Report at 19th CPC National Congress," Xinhua, November 3, 2017.

[71] "Xi Jinping: Move Forward the Construction of a Cyber Superpower Through Indigenous Innovation" ["习近平: 自主创新推进网络强国建设"], Xinhua, April 21, 2018. Translation via Rogier Creemers, Paul Triolo, and Graham Webster, "Translation: Xi Jinping's April 20 Speech at the National Cybersecurity and Informatization Work Conference," New America, April 30, 2018.

> operate in a stable manner, and the broad popular messes' interests will be difficult to guarantee.[72]

Likely building on this earlier Party guidance since 2013, Chinese efforts appear to have picked up again in 2017–2018; both the PLA and likely other parts of the Party-state propaganda apparatus increased their activity. Most notably, the large and now well-known Spamouflage network likely began operating by 2017 and definitely by 2018, although it leveraged some accounts created as early as 2012.[73] Although Spamouflage was always assessed to be under the control or at least guidance of China, China's Ministry of Public Security (MPS) was publicly identified as the Party-state actor behind Spamouflage in 2023, based on a U.S. Department of Justice indictment of 34 MPS officers and corroborating reporting by others.[74] Similarly, the PLA was first directly and explicitly accused of social media manipulation by Taiwan in 2018 for interfering with its elections that year, very likely the culmination of a PLA Base 311 effort dating back to at least early 2018.[75] By this time, Party-state media were also already buying fake followers to boost their influence on foreign social media platforms.[76]

Beyond the PLA and MPS beginning their social media manipulation, other Party-state actors appear to have become interested over this time frame who likely supported this activity down the road in 2019 and later. For example, the CAC appears to have first paid attention to foreign social media by 2018, although possibly earlier. In a September 2018 article, the head of CAC specifically addressed using foreign social media as part of its international propaganda strategy:

> We must strengthen the construction of international dissemination capabilities, innovating promotional ideas, operational mechanisms, discourse systems, and ways of expression; be adept at using online media and social media platforms; meticulously bring up topics; actively communicate information; strengthen the dissolution of doubts and ambiguities; realistically ensure that people are persuaded by reason and that people are moved by emotion; and display a real,

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[72] Xinhua, 2018.

[73] For the original report, see Ben Nimmo, C. Shawn Eib, L. Tamora, *Cross-Platform Spam Network Targeted Hong Kong Protests*, Graphika, September 2019. For a good recent review of open-source reporting on Spamouflage, see Patrick Warren, Darren Linvill, Leland Fecher, Jayson Warren, Steven Sheffield, Jack Taylor, Alexa Gubanich, Parker Hundley, Josiah Lamont, Sarah Meadows, Josephine Rohrer, Molly Sutton, and Shay Easler, *The 5-year Spam: Tracking a Persistent Chinese Influence Operation*, Clemson University Watt Family Innovation Center Media Forensics Hub, 2023.

[74] Donie O'Sullivan, Curt Devine and Allison Gordon, "China Is Using the World's Largest Known Online Disinformation Operation to Harass Americans, a CNN Review Finds," CNN, November 13, 2023.

[75] Beauchamp-Mustafaga and Drun, 2021. For another consideration of Chinese efforts against Taiwan's 2018 elections, see Paul Huang, "Chinese Cyber-Operatives Boosted Taiwan's Insurgent Candidate," *Foreign Policy*, June 26, 2019.

[76] Confessore et al., 2018.

> three-dimensional, and complete China to the world. Deepen international exchange and cooperation in online propaganda and public opinion work.[77]

This came after a broader article by CAC thought leaders in 2017 explaining what Xi's calls for making China a "cyber superpower" [网络强国] meant for the CAC, which specifically emphasized the importance of ensuring that "online positive propaganda must become bigger and stronger, so that the Party's ideas always become the strongest voice in cyberspace."[78] The article specifically called for the Party to

> actively use new technologies and new applications to effectively guide the progression of online public opinion, grasp the evolution and laws of the online public sentiment, prevent hot issues from involving the economic and social livelihood of the people, and prevent mass incidents and public opinion from becoming online ideological patterns and issues. Play an important role in cyber comments and public opinion guidance and make cyberspace cleaner.[79]

This illustrates how the party bureaucracy directly translated Xi's general guidance on propaganda into strategy for foreign social media.

Phase 3, 2019–2023: Full Embrace of Foreign Social Media Manipulation

The big coming out party for CCP disinformation targeting Western audiences was the Hong Kong protests in 2019 and the outbreak of coronavirus disease 2019 (COVID-19) in 2020. China's blatant (and poorly crafted) disinformation during the 2019 Hong Kong protests led to the first publicly disclosed takedowns of suspected Chinese government accounts by Western social media platforms.[80] Another major accelerant for Chinese disinformation on social media was COVID-19, specifically the Party's desire to counter or drown out foreign accusations that the outbreak of COVID-19 in China, possibly from a lab accident, represented a failure of CCP

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[77] Zhuang Rongwen [庄荣文], "Scientifically Understanding the Natural Laws of Online Communication, Striving to Boost the Level of Internet Use and Network Governance" ["科学认识网络传播规律 努力提高用网治网水平"], *Seeking Truth*, September 16, 2018, translation via Rogier Creemers, Paul Triolo, and Graham Webster, "Translation: China's New Top Internet Official Lays Out Agenda for Party Control Online," New America, September 24, 2018.

[78] Cyberspace Administration of China Theoretical Studies Center Group [中央网信办理论学习中心组], "Deepening the Implementation of General Secretary Xi Jinping's Strategic Thinking on Building China into a Cyber Superpower: Steadily Advancing Cybersecurity and Informatization Work" ["深入贯彻习近平总书记网络强国战略思想 扎实推进网络安全和信息化工作"], *Seeking Truth*, September 15, 2017, translation via Elsa Kania, Samm Sacks, Paul Triolo, and Graham Webster, "China's Strategic Thinking on Building Power in Cyberspace," New America, September 25, 2017.

[79] Cyberspace Administration of China Theoretical Studies Center Group [中央网信办理论学习中心组], 2017.

[80] Kate Conger, "Facebook and Twitter Say China Is Spreading Disinformation in Hong Kong," *New York Times*, August 19, 2019.

governance.[81] Around this same time, Chinese diplomats also embraced Western social media to get their message out through overt propaganda, sometimes with brash wolf warrior diplomacy messaging.[82]

This era saw continued Xi guidance for these efforts into the late 2010s, adding an emphasis on leveraging AI for the Party's efforts. In a speech at the January 2019 Politburo Collective Study Session, which focused on CCP control of domestic media and public opinion, Xi called for studying the application of AI in the collection, production, and distribution of news and for gauging feedback to improve the Party's ability to guide public opinion [舆论引导能力].[83] Later, in another Politburo Collective Study Session in May 2021, which focused on improving China's international communication capabilities [国际传播能力建设]—that is, foreign propaganda work—Xi declared that external influence efforts should be redefined from being "foreign communications" [对外传播] to "strategic communications" [战略传播], reflecting the need to coordinate messaging efforts between the Party, the PLA, media outlets, and other elements of society.[84] Xi repeated his call for the Party-state's propaganda apparatus to "tell China's story well" [讲好中国故事], then emphasized that they should "effectively carry out international public opinion guidance and public opinion struggle" [有效开展国际舆论引导和舆论斗争]. Xi went on to note that this revamped approach was crucial to enabling China to take advantage of the "great changes unseen in a century" [百年未有之大变局] currently occurring within the global balance of power, which is how Xi and the broader Party-state obliquely

[81] Muyi Xiao, Drew Jordan, Meg Felling, and Christoph Koettl, "How China Is Reshaping the Coronavirus Narrative," *New York Times*, March 18, 2020; Kao and Li, 2020; Zhong et al., 2020.

[82] Jessica Brandt and Bret Schafer, "How China's 'Wolf Warrior' Diplomats Use and Abuse Twitter," Brookings Institution, October 28, 2020; Peter Martin, *China's Civilian Army: The Making of Wolf Warrior Diplomacy*, Oxford University Press, 2021; Marcel Schliebs, Hannah Bailey, Jonathan Bright, and Philip N. Howard, *China's Public Diplomacy Operations: Understanding Engagement and Inauthentic Amplification of PRC Diplomats on Facebook and Twitter*, Programme on Democracy & Technology, Oxford Internet Institute, University of Oxford, May 2021. For analysis of their social media engagement, see Linjiang Guo and Qian Qin, "Wolf Warrior Spreads Superior: The Narrative and Effectiveness of Chinese Public Diplomacy Behaviours on Twitter," *Journal of Chinese Political Science*, April 2024.

[83] Xinhua, "During the 12th Collective Study of the Political Bureau of the CCP Central Committee, Xi Jinping Emphasized Promoting In-Depth Development of Media Integration and Consolidating the Common Ideological Foundation of the Whole Party and the People of the Country" ["习近平在中共中央政治局第十二次集体学习时强调 推动媒体融合向 纵深发展 巩固全党全国人民共同思想基础"], January 25, 2019.

[84] "Xi Jinping Stressed During the 30th Collective Study of the Political Bureau of the Communist Party of China Central Committee the Need to Strengthen and Improve International Communication Work to Showcase a Real, Three-Dimensional and Comprehensive China" ["习近平在中共中央政治局第三十次集体学习时强调 加强和改进国际传播工作 展示真实立体全面的中国"], Xinhua [新华], June 1, 2021; Adam Ni and Yun Jiang, trans., "Xi on External Propaganda and Discursive Power," China Neican, June 4, 2021. For analysis, see David Bandurski, "Powers of Persuasion," China Media Project, June 2, 2021.

discuss their perception of U.S. decline and China's inevitable rise.[85] According to this formulation, ongoing PRC institutional reforms and technological investments will play a key role in obviating U.S. "first mover advantage" in both online and legacy media forums which has heretofore granted it agenda setting (narrative) power within the global media environs.[86] This in turn will enable China to more effectively exert "discourse power" [话语权] beyond its borders and to more successfully evangelize its preferred narratives abroad.[87]

More recently, in his October 2022 work report to the CCP's 20th Party Congress, Xi called for the Party to improve its "ideological work" [意识形态工作], in part by "strengthening the construction of an omni-media communication [propaganda] system" [全媒体传播体系] and promoting the formation of a "good network ecology" [良好网络生态], that is, pro-CCP online discussions.[88] Specifically turning to international audiences, Xi called for

> enhancing the communication power [传播力] and influence power [影响力] of Chinese civilization, adhere to the position of Chinese culture, tell China's story well, spread China's voice well [传播好中国声音], show a credible, lovable and respectable image of China [可信, 可爱, 可敬的中国形象], and promote Chinese culture to better go global [更好走向世界].[89]

The UFWD appears to be another Party-state actor that became more involved in foreign social media manipulation around this time, specifically in response to the 2019 Hong Kong protests. A key node of UFWD efforts on social media is its China News Service (CNS). A UFWD deputy wrote in 2018: "As an important propaganda unit of the United Front, CNS must adhere to the concept of 'newspapers run by politicians' and thoroughly carry out political awareness work. CNS's important mission is to do good united front propaganda work."[90] In August 2019, as the Hong Kong protests were raging, CNS announced that it had awarded a

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[85] Center for Strategic Translation, "Great Changes Unseen in a Century," 2022; Zeng Xiangmin [曾祥敏], Tang Xuan [汤璇], and Bai Xiaoqing [白晓晴], "Strengthen the Construction of China's Foreign Discourse System from a Strategic Perspective" [从战略高度加强中国对外话语体系建设], *Guangming Daily*, November 11, 2019. For more on the phrase, see Rush Doshi, *The Long Game: China's Grand Strategy to Displace American Order*, Oxford University Press, 2021; Rush Doshi, "'Great Changes Unseen in a Century': The Elusive Phrase Driving China's Grand Strategy," *China Leadership Monitor*, Summer 2021.

[86] Chen Yue [陈岳] and Ding Zhangchun [丁章春], "Discourse Power in Sino-Western Relations" [中西关系里的话语权], *People's Daily*, January 18, 2017.

[87] Toni Friedman, "Lexicon: 'Discourse Power' or the 'Right to Speak' (话语权, Huàyǔ Quán)," DigiChina, March 17, 2022.

[88] "Xi Jinping Delivered a Report to the 20th CPC National Congress on Behalf of the 19th CPC Central Committee" ["习近平代表第十九届中央委员会向党的二十大作报告"], Xinhua, October 16, 2022.

[89] "Xi Jinping Delivered a Report . . . ," 2022.

[90] "China News Service Holds Mid-Year Work Meeting, Tan Tianxing Puts Forward Four Requirements" ["中国新闻社召开年中工作会 谭天星提四点要求"], China News Service, August 6, 2018, via Filip Jirouš and Petra Ševčíková, "Covert Propaganda Operations in Plain Sight: The CCP United Front System's Media Network in Europe," Sinopsis, July 2021.

contract worth roughly $175,000 for two Chinese companies to boost its influence on Western social media.[91] As one of the companies told a Western journalist who asked about their services, "[w]e use a special department to evaluate this. We have specialist marketing teams targeting Twitter, Facebook, and YouTube to aid your expansion. We can do it."[92] CNS was followed by China's Cyberspace Administration and MFA, which undertook similar contracts in 2019.[93] All told, Quartz tallied over $1 million spent by the Party-state in 2019 to improve its social media influence via contracted Chinese companies. It also appears that China expanded its social media monitoring to include foreign social media by at least 2019.[94]

The outbreak of the COVID-19 pandemic in 2020 drove CNS to increase its social media manipulation once again.[95] As ProPublica reported, just as these Party-state's efforts to build its influence were making progress in the wake of the 2019 Hong Kong protests, COVID-19 presented another critical use case to defend the Party's handling of the early spread in Wuhan, or otherwise distract by blaming the United States and others.

The apparent turning point of China beginning to use social media for foreign election interference in the United States was in the 2022 election cycle. A declassified NIC report on foreign election interference during the U.S. 2022 midterm elections concluded that "China tacitly approved efforts to influence a handful of midterm races involving members of both US political parties."[96] Specifically, the NIC "assess[ed] that PRC intelligence services, diplomats, and online influence actors conducted activities [. . . including] covertly denigrating a named US senator online using inauthentic accounts."[97] This came after Mandiant revealed the first evidence that, in April 2021, Beijing sought to "physically mobilize protestors in the United States," specifically in New York City around the issue of COVID-19.[98] This contrasts with assessments of Chinese activity during the U.S. 2020 elections, for which the NIC assessed that "China did not deploy interference efforts and considered but did not deploy influence efforts intended to change the outcome of the US Presidential election."[99] And specifically for its ongoing social media manipulation efforts, Graphika concluded that, "[i]n essence, rather than

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[91] "China's Propaganda Machine Is Spending . . . ," 2019.

[92] Ma Lap-hak, Pan Jiaqing, and Fok Leung-kiu, 2019.

[93] "China's Propaganda Machine Is Spending . . . ," 2019.

[94] Cadell, 2021.

[95] Jeff Kao and Mia Shuang Li, "How China Built a Twitter Propaganda Machine Then Let It Loose on Coronavirus," *ProPublica*, March 26, 2020.

[96] NIC, 2022.

[97] NIC, 2022.

[98] Ryan Serabian and Lee Foster, "Pro-PRC Influence Campaign Expands to Dozens of Social Media Platforms, Websites, and Forums in at Least Seven Languages, Attempted to Physically Mobilize Protesters in the U.S.," Mandiant, September 7, 2021.

[99] NIC, "Foreign Threats to the 2020 US Federal Elections," March 10, 2021.

being a vehicle for election interference, Spamouflage is a cheerleader for Chinese state narratives of China's rise and America's fall."[100] So far in 2024, despite Xi's reported promise to President Joe Biden that China would not interfere in the U.S. 2024 elections, U.S. government and independent researchers have found evidence that Beijing is actively seeking to "influence U.S. political conversations."[101]

Understanding the Chinese Military's Approach to Cyber-Enabled Influence Operations and Social Media Manipulation

To comply with the guidance laid out by Party leadership, the PLA has embarked on a project of reforming and updating its capacity to wage public opinion warfare. While China's military constitutes only one part of its overall foreign influence ecosystem, its leaders nevertheless place a strong emphasis on cultivating public opinion as being a key enabling factor in modern operations. To wit, long-standing PLA formulations for controlling the information domain such as its "Three Warfares" operational concept highlight the need to combine efforts in the public opinion, psychological, and legal domains to deter and demoralize potential adversaries.[102] Moreover, recent PLA authoritative texts, such as the 2020 edition of the PLA NDU's *Science of Military Strategy*, argue that the advent of globally networked communications has elevated the comparative importance of public opinion struggle, enabling nations to employ such tools as mass media and online messaging more effectively to directly disrupt the societal cohesion of their geopolitical adversaries.[103] Consequently, the text argues that public opinion warfare has become a focal point for struggle in modern warfare with the potential to directly affect the outcomes of modern conflicts.[104]

Since its founding in 1927, the PLA has regarded the ability to shape the cognition of its foes and allies alike as being a core capability, a position encapsulated in Mao Zedong's aphorism that the CCP "can only defeat the enemy by holding propaganda leaflets in the left hand and bullets in the right."[105] This stance is born of the PLA's role as the armed wing of the CCP,

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[100] Ben Nimmo, Ira Hubert, and Yang Cheng, *Spamouflage Breakout: Chinese Spam Network Finally Starts to Gain Some Traction*, Graphika, February 2021.

[101] Sean Lyngaas and MJ Lee, "Exclusive: Xi Promised Biden China Wouldn't Interfere in 2024 Election," CNN, January 31, 2024; Simone McCarthy, "Blinken Tells CNN the US Has Seen Evidence of China Attempting to Influence Upcoming US Elections," CNN, April 26, 2024; Elise Thomas, "Pro-CCP Spamouflage campaign experiments with new tactics targeting the US," Institute for Strategic Dialogue, April 1, 2024; Graphika, 2024.

[102] Beauchamp-Mustafaga, 2023a.

[103] Xiao Tianliang [肖天亮], ed., *Science of Military Strategy* [战略学], National Defense University Press [国防大学出版社], 2020.

[104] Xiao Tianliang [肖天亮], 2020.

[105] Zhang Wei [张伟], Tang Xiaoyan [汤晓燕], and Chen Xi [陈曦], "A Brief Analysis of the Development Trend of Public Opinion Warfare in Modern Wars" ["简析现代战争中舆论战的发展走向"], *Military Correspondent*, August 2019.

which asserts that peacetime propaganda work and psychological operations are crucial to wartime success, especially against materially superior adversaries. Accordingly, successive iterations of PLA doctrinal texts, such as its Political Work Regulations [政治工作条例], have stressed the need to build the capability to exert narrative control within the global information environment, with a special emphasis on drawing on the expertise of civilian cadres and other sympathetic experts to aid those efforts.[106] This trend has come into stark relief with the rise of networked global communications, which grant states an unprecedented ability to reach and exert influence over foreign audiences. Hence, as the PRC has invested in weapon platforms to contest the land, air, sea, and space domains it has concurrently sought to instrumentalize emerging information technologies to wage public opinion warfare [舆论战].

Since the 2000s, the Chinese military has framed its approach to influence operations (IO) under the "Three Warfares" [三种战法 or 三战] operational concept.[107] This includes *psychological warfare* [心理战], *public opinion warfare* [舆论战], and *legal warfare* [法律战]. In general, psychological warfare is targeted at adversary decisionmakers and troops, while public opinion warfare is targeted at the broader adversary population. Both concepts can span the peacetime-wartime continuum. In line with broader Chinese military theory, each of these also has common variations, such as *public opinion struggle* [舆论斗争], a common CCP concept in which *struggle* places more emphasis on the constant back-and-forth between two or more opposing sides, and *public opinion advantage* [舆论优势], the idea of seizing military advantage over the adversary in the field of public opinion.[108]

The Three Warfares concept has evolved over the years along with technology.[109] The advent of the internet drove the idea of *online public opinion warfare* [网络舆论战], which explored how to adapt public opinion warfare to take advantage of the internet as a new medium and channel for such activity.[110] More recently, Chinese military IO researchers have embraced

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[106] Maryanne Kivlehan-Wise, "Military Political Work at the CCP's Centennial," *China Brief*, Vol. 21, No. 12, June 18, 2021.

[107] For a recent review, see Beauchamp-Mustafaga, 2023a.

[108] The authors thank Jeff Engstrom for this insight.

[109] Beauchamp-Mustafaga, 2023a.

[110] For some relevant material in the 2000s, see Li Jun [李俊], "Research on Online Public Opinion Warfare" ["网络舆论战研究'], master's thesis, PLA National Defense University of Technology [国防科技大学], 2005; Ji Chenjie [季陈杰] and Liu Wei [刘威], "A Brief Exploration of Online Public Opinion Warfare" ["网络舆论战浅探"], *Military Correspondent* [军事记者], January 2009; Guo Hongbin [郭红斌], "Main Characteristics of Online Public Opinion War" ["网络舆论战的主要特征"], *Military Correspondent* [军事记者], September 2009; Zhou Yang [周洋], "Research on Optimization of Propaganda Effectiveness in Online Public Opinion Warfare" ["网络舆论战宣传致效的优化研究"], *Military Correspondent* [军事记者], December 2009.

For some from 2010–2015, see Liang Wei [梁卫], "Online Public Opinion Warfare: An Important Strategic Direction for Modern Warfare" ["网络舆论战:现代战争的重要战略方向"], *Journal of Strategy and Decision-*

broader PLA views of future warfare being increasingly driven by artificial intelligence to develop the concept of *intelligentized public opinion warfare* [智能化舆论战].[111]

This broader PLA view of the evolving nature of warfare and the desire to embrace emerging technologies is driving PLA researchers to develop a new operational concept that looks poised to replace, or at least supplement, the traditional Three Warfares: *cognitive domain operations* [认知域作战] (CDO).[112] This newer operational concept starts with the growing PLA

Making [战略决策研究], September 2010; Wang Yue [王跃], Yao Fang [姚芳], and Wang Pei [王培], "A Brief Discussion on the Offensive of Online Public Opinion Warfare in System-Based Operations" ["基于体系作战中网络舆论战进攻刍论"], *Electronic Test* [电子测试], November 2013; Xiao Xunlong [肖勋龙] and Li Shouqi [李寿其], "Theoretical Analysis of Online Public Opinion Warfare" ["网络舆论战的理论探析"], *National Defense Technology* [国防科技], Vol. 35, No. 2, April 2014; Zhang Jingxuan [张晶轩] and Liao Dongsheng [廖东升], "The Psychological Significance of Online Public Opinion Warfare" ["网络舆论战的心理学意义"], *National Defense Technology* [国防科技], Vol. 35, No. 2, April 2014; Xu Yingxue [徐英雪] and Lan Fen [兰芬], "WeChat: a New Weapon of Online Public Opinion Warfare" ["微信:网络舆论战的新利器], *National Defense Technology* [国防科技], Vol. 35, No. 2, April 2014; Wu Jie [伍杰] and Liao Dongsheng [廖东升], "Analysis of Online Public Opinion Effectiveness Evaluation" ["网络舆论战效能评估探析"], *National Defense Technology* [国防科技] ,Vol. 35, No. 2, April 2014; Yang Tengfei [杨腾飞], Zhu Yaohua [朱曜华], and Zhang Weichao [张伟超], "The Characteristics and Offensive-defensive Countermeasures of the Network Consensus Warfare in Peacetime" ["和平时期网络舆论战的特点及对策刍议"], *National Defense Technology* [国防科技], Vol. 35, No. 2, April 2014; Su Ru [苏锐] "Fully Understand the Importance of Online Public Opinion Warfare" ["充分认识网络舆论战的重要性"], *Time Education* [时代教育], December 2015.

For some from 2016–2020, see Li Bicheng [李弼程], "Model for a System of Online Public Opinion Struggle and Countermeasures" ["网络舆论斗争系统模型与应对策略"], *National Defense Technology* [国防科技], October 2016; Li Bicheng [李弼程], "A Brief Introduction of All Domain Integrated Joint Operations for Online Public Opinion Struggle" [网络舆论斗争的全域一体联合作战], *Defense Technology Review* [国防科技], April 2017; Wang Shizhuo [王世卓], "War Gaze: Analysis of the U.S. Military's Online Public Opinion Struggle Strategies" ["战争目光: 美军网络舆论斗争策略分析"], *Military Digest* [军事文摘], November 2019; Zhao Yu [赵宇], "An Exploration Into the Application of Journalism and Communication Principles in Online Public Opinion Warfare" [新闻传播学原理在网络舆论战中的运用探微"], *Journal of News Research* [新闻研究导刊], February 2020.

For an authoritative PLA book on the topic, see Wu Jieming [吴杰明] and Liu Zhifu [刘志富], *An Introduction to Public Opinion Warfare, Psychological Warfare, and Legal Warfare* [舆论战心理战法律战概论], National Defense University Press, 2014.

[111] *Intelligentization* refers to the PLA concept of warfare becoming driven by intelligent systems. For some examples applied to IO, see Zhang Zhiwei [张智伟], "Towards Intelligentized Online Public Opinion Warfare" ["走向智能化的网络舆论战"], *Political Workers* [政工导刊], February 2020; Sun Yixiang [孙亦祥] and Yu Yuanlai [余远来], "A Brief Discussion on 'Intelligentized Public Opinion Warfare'" ["刍议 '智能化舆论战'"], *Military Correspondent* [军事记者], January 2022; Liu Yong [刘永], "Research on and Inspiration From the Application of Social Media in Public Opinion Warfare by Foreign Military" ["外军社交媒体在舆论战中的运用研究和启示"], *Military Correspondent* [军事记者], June 2022; Zhang Xiaoping [张小平] and Zheng Xuan [郑玄], "Academic Frontier and Research Prospects of Military Communication Studies" ["军事传播学学术前沿与研究展望"], *Military Culture Studies* [军事文化研究], June 2023; Zeng Tao [曾涛], "On How to Strengthen the Governance of Negative Public Opinion Related to the Military Under the Conditions of Informatization and Intelligence" ["浅谈如何加强信息化智能化条件下涉军负面舆情治理"], *Defence Industry Conversion in China* [中国军转民], September 2023.

[112] For more on this, see Beauchamp-Mustafaga, 2023a.

recognition of the cognitive domain [认知域, 认知领域, or 认知空间] as a key domain of warfare and thus seeks to design an operational concept to gain advantage in this domain. PLA discussions of CDO typically center on four key objectives: reading the brain [读脑], controlling the brain [控脑], mirroring the brain [类脑], and strengthening the brain [强脑].[113] More relevant for this report, CDO also appears to be the driving operational concept for at least some PLA planning for social media manipulation.[114]

Although these concepts originate with the PLA, they are increasingly being adopted by the broader Chinese Party-state. In August 2022, the Chinese MFA spokesperson refuted U.S. claims of PRC social media disinformation about Xinjiang in part by saying,

> The report falsely accuses China of using disinformation to manipulate public opinion on Xinjiang. This is like nothing but a thief crying "stop thief." Propaganda and infiltration veiled as "global engagement"—that's what this center of the US Department of State actually does. It is a hotbed of disinformation and a command center for cognitive warfare.[115]

MFA researchers have similarly embraced this, along with other parts of the Chinese government.[116] The Chinese Party-state propaganda apparatus has even adopted this concept in criticizing foreign (U.S.) actions.[117] Unsurprisingly, the Chinese defense industry has also adopted this idea.[118]

Understanding Li Bicheng's Terminology

Returning to Li Bicheng as the focus of this report, he adopts the concepts of "online public opinion warfare" [网络舆论战] and "online public opinion struggle" [网络舆论斗争] for most of his discussions of influencing target audiences. This is likely a reflection of his age, given he

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[113] Beauchamp-Mustafaga, 2023a. For example, see Guo Yunfei [郭云飞], "Cognitive Domain Operations Enter the Era of Seizing Command of the Mind" ["认知域作战进入制脑权争夺时代"], *PLA Daily*, June 2, 2020.

[114] Beauchamp-Mustafaga, 2023a; Beauchamp-Mustafaga and Drun, 2021.

[115] Zhao Lijian, "Foreign Ministry Spokesperson Zhao Lijian's Regular Press Conference," Ministry of Foreign Affairs of the People's Republic of China, August 29, 2022.

[116] For research by the MFA's think tank, the China Institute for International Studies [中国国际问题研究所] (CIIS), see Xiang Haoyu [项昊宇], "Japan's Pursuit of Military 'Relaxation' Is Very Subtle" ["谋求军事 '松绑,' 日本这招很隐蔽"], November 7, 2022. For research by SIIS: Yu Xintian [俞新天], "The Threat of Cognitive Warfare against China and the Upgrade of China's People-to-People Diplomacy" [西方对华认知战的威胁与中国民间外交的提升], *International Studies* [国际问题研究], No. 6, 2022.

[117] Yu Ning, "US' 'Cognitive Warfare' Over Taiwan Futile in Face of Facts, China's Strength," *Global Times*, July 7, 2022; Yang Yucai, CSIS' War Games, Designed for Cognitive Warfare Against China, Will Have Little Influence," *Global Times*, August 24, 2022; Zhang Yunbi, "US 'Cognitive Warfare' Tricks Stir Up Tension," *China Daily*, March 7, 2023.

[118] China Electronics Corporation (CETC) 30th Institute: Lu Wei [吕玮] and Liu Bingjie [刘冰洁] "Psychological Offense Is Preferred Tactic: Recognitive Battles in Russia-Ukraine Conflict" ["攻心为上：俄乌冲突中的认知战交锋"], *Information Security and Communications Privacy* [信息安全与通信保密], November 2022.

was still in the beginning of his career when broader PLA discussions of the Three Warfares and online public opinion warfare were gaining traction. His lack of adoption of the newer CDO concept is interesting but does not eliminate his credibility as a representative sample of PLA interest in foreign social media manipulation.

Li uses a consistent definition of *online public opinion warfare* in all his research:

> activities involving the use of public opinion information as the weapon and network technology and online media as the means to conduct targeted information dissemination [信息传播] and information penetration [信息渗透] according to specific strategic intentions, thereby influencing the cognitive judgment [认知判断] and behavioral choices [行为选择] of the audience.[119]

Li further clarifies the objective of the PLA's public opinion warfare: "effectively control the public opinion situation, influence the people's sense of belonging, and gain public opinion advantage for one's own side."[120] And he stated its role in PLA operations: "a special measure for winning over the people, solidifying political power, and influencing the progression of war. It plays an important role in seizing political initiative and military victories." He later adds that his research is designed to develop technology that can "push online public opinion in a direction that is favorable to us."

What is noteworthy is that Li is also embracing General Secretary Xi's favorite term of *public opinion struggle*, adapted for cyber-enabled influence operations as *online public opinion struggle*.[121] This highlights that Li's research focus follows not just explicit guidance from CCP leadership but also reflects the leadership's mindset: a constant struggle for winning hearts and minds around the world.

Finally, it is useful to differentiate among some terms that PLA researchers employ to describe different approaches to manipulating online media. For this report, we generally translate 网络水军 [wangluo shuijun] as *astroturfing*, although it literally means "online water army" and can also be used to refer to the act of organizing groups of people to artificially influence online discourse. PLA sources also discuss *sock puppets* [马甲 or 傀儡], which are inauthentic accounts.[122] Finally, PLA sources also discuss *social bots* [社交机器人], which are typically defined as automated accounts, often specifically sock puppet or inauthentic accounts.

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[119] See, for example, Li Bicheng [李弼程], 2016.

[120] Li Bicheng [李弼程], 2016.

[121] "Xi Jinping Stressed During the 30th collective study . . . , 2021. Ni, and Jiang, 2021; Bandurski, 2021; Samuel Brazys, Alexander Dukalskis, and Stefan Müller, "Leader of the Pack? Changes in 'Wolf Warrior Diplomacy' After a Politburo Collective Study Session," *China Quarterly*, Vol. 254, 2023.

[122] Other terms include 社交网络机器人 or 社交机器人 or 社会机器人 or 机器人账号 or 网络水军机器人 or 政治机器人 or 认知域作战机器人. *People's Daily* referred to them as "puppet accounts" (木偶账户). See Zhao Qiang [赵强], "Insight Behind the Scenes of Western Communication Power" ["透视西方传播权力转移的背后"], *People's Daily*, April 16, 2018.

Conclusion

The Party-state's love for foreign social media manipulation exploded over 2019–2020 with the Hong Kong protests and outbreak of COVID-19. But, in retrospect, it was really a growing crescendo that began in the early 2010s with the realization that social media is not just a force to be reckoned with but also to be harnessed. The early experimentation in the late 2010s with the creation of the Spamouflage network in 2017 and CCP election interference against Taiwan's 2018 elections set the stage for the dramatic growth of Chinese disinformation on social media since 2019. Despite this effort, most accounts of China's performance found it to be middling at best through 2023, frequently struggling to gain authentic traction on foreign social media.[123] Li's research, documented in the next several chapters, thus came at an opportune time as the Party was interested in how best to position itself to win the war for hearts and minds on foreign social media. Generative AI offers the Party the ability to improve its performance, in line with Li's vision.

[123] For some efforts to gauge effectiveness, see Jordan Schneider, "China's Hopeless Twitter Influence Operations," ChinaTalk, October 29, 2020; Carmen Paun and Susannah Luthi, "What China's Vax Trolling Adds Up to," *Politico*, January 28, 2021.

Chapter 3. An Overview of Li Bicheng's Career and Research

Li Bicheng [李弼程] is no ordinary researcher. We argue that he is, at a minimum, an exemplar case study and, quite possibly, one of the main figures involved in devising new approaches to public opinion warfare for the PLA as a senior defense academician who specializes in researching AI and information control applications. For the past decade, Li has been at the forefront of research into techniques for intelligentized [智能化] public opinion warfare and has published a wide array of research on topics ranging from online sentiment analysis [网络舆情分析] to the use of advanced, large-scale botnets in public opinion struggle. Crucially, Li's work has not been confined to the ivory tower of intra-academic research circles. Rather, he has received extensive financial backing from the Chinese military and broader Party-state apparatus, indicating that PRC officials have an interest in operationalizing his research. Concurrently, Li's career trajectory is illustrative of the institutionally cross-cutting nature of PRC influence operations. Indeed, in addition to his role as a researcher, Li facilitates talent exchanges and coordination between experts from the PLA, UFWD, and civilian academia.

While Li does not hold a *de jure* leadership position within the Party, PLA, or UFWD, his career nevertheless merits scrutiny for three main reasons. First, Li's status as a thought leader within the field of AI development suggests that his research is broadly representative of PRC ambitions to augment its propaganda work system using emerging intelligentized technologies. Second, at a more granular level, examining Li's scholarly work serves to uncover specific tactics, techniques and procedures that the PLA may use in future influence campaigns against such targets as Taiwan and the United States. Finally, Li's coordinating role straddling China's military and civilian research apparatuses provides an invaluable case study demonstrating how the PRC has sought to break down institutional stove piping between its various influence operations organs. We provide additional details in Table 3.1.

Table 3.1. Understanding Li's Importance for Chinese Influence Operations

	Evidentiary Requirements	Broader Operational Impact	Li's Score
Research quality	Publications in prestigious journals	Opportunity to lead community thinking	Yes
	Winning prestigious research grants	Opportunity to develop new ideas and/or capabilities	Yes
Access	Prestigious science and technology awards that bring luminaries into contact with top Party leadership	Opportunity to pitch ideas to key decisionmakers	No
	Security clearance or direct reference to classified material, including working on classified research	Potential access to covert activities or organizations carrying them out	Yes

	Evidentiary Requirements	Broader Operational Impact	Li's Score
	Meetings with top Party or PLA decisionmakers	Opportunity to pitch ideas to key decisionmakers or shape operational practices	No
	Presence on boards of companies or Party committees for SASTIND or related defense industry organizations	Opportunity to direct and select for novel ideas or research and development	No
	Collaboration with frontline, operational units	Opportunity to implement ideas and research	Yes
Influence	Appointment to directorship positions or positions that can direct funding	Opportunity to direct and select for novel ideas or research and development	Yes
	Works that are frequently cited by other academics, especially PLA academics		Yes
	Any lectures or training sessions given to the PLA or anywhere else	Opportunity to shape operational practices	Some

NOTE: SASTIND = State Administration of Science, Technology and Industry for National Defense.

Li's Background and Career Progression

Li Bicheng is a scholar and defense academician specializing in machine learning applications and public opinion control research. Li was born in 1970 in Hengnan County, Hunan Province, and received a bachelor's degree in mathematics education from Xiangtan Normal University in 1992.[124] After completing his undergraduate studies, Li went on to attend the PLA's National University of Defense Technology [国防科学技术大学] (NUDT), where he completed a master's degree in probability theory and mathematical statistics in 1995, followed by a doctorate in systems engineering in 1998.[125] Immediately after completing his doctoral work, Li affiliated with PLA IEU, where he eventually attained the title of professor in 2004.[126] Given his publicly available biographical data, it does not appear that Li ever actively served as a commissioned member of the PLA but, rather, maintained a position as a civilian academician.[127]

Li has frequently engaged with the international scientific community, including spending a year in the UK and publishing in international journals as recently as 2022, although he did at times obfuscate his PLA affiliation. For instance, starting around 2004, he regularly submitted journal articles and conference papers for publication by the Institute of Electrical and Electronics Engineers (IEEE) under affiliation with the "Zhengzhou Information Science and

[124] In 2003, Xiangtan Normal University [湘潭师范学院] merged with the Xiangtan Institute of Technology [湘潭工学院] to form the Hunan University of Science and Technology [湖南科技大学].

[125] Huaqiao University [华侨大学], "Li Bicheng" ["李弼程"], webpage, undated-b.

[126] Huaqiao University [华侨大学], undated-b.

[127] For more, see Roy Kamphausen, ed., *The People of the PLA 2.0*, National Bureau of Asian Research, 2021.

Technology Institute," which is a common alias used by PLA IEU staff to obfuscate institutional connections to the Chinese military.[128] Moreover, from 2004–2005 he appears to have taken a leave of absence from IEU to become a visiting scholar at the University of Manchester in the UK, although it is unclear whether his advisor, an AI expert, knew he was affiliated with the PLA when they were working on facial recognition, among other topics.[129] In early 2016, Li left IEU to take up his current position at Huaqiao University's School of Computer Science and Technology.[130] A brief chronology of his work history is in Table 3.2.

Table 3.2. Li's Career Progression

Date	Occupation
September 1988–June 1992	Earned B.A. in Mathematics Education [数学教育] from Xiangtan Normal University
August 1992–March 1995	Earned MSc in Probability Theory and Mathematical Statistics [概率论与数理统计] from NUDT
May 1995–June 1998	Earned Ph.D. in Systems Engineering [系统工程] from NUDT
June 1998–August 1999	Lecturer [讲师], PLA Huaqiao University (IEU) Information Science Department [信息工程学院信息科学系]
September 1999–November 2000	Lecturer [讲师], IEU Information Technology Institute [信息技术学院]
December 2000–April 2002	Associate Professor [副教授], IEU Information Technology Institute
May 2002–November 2004	Associate Professor [副教授], IEU Information Engineering Institute [信息工程学院]
September 2004–September 2005	Visiting Scholar, University of Manchester (United Kingdom)
December 2004–April 2016	Professor [教授], IEU Information Engineering Institute
May 2016–Present	Professor [教授], Huaqiao University School of Computer Science and Technology [计算机科学与技术学院]

[128] IEEE Xplore, "Author Prolife: Li Bicheng," webpage, undated. For more on PLA cover affiliations, see Alex Joske, *Picking Flowers, Making Honey: The Chinese Military's Collaboration with Foreign Universities*, Australian Strategic Policy Institute, October 2018.

[129] His advisor does not list Li as a student on his main faculty page but does list him in other places. See Yin Hujun, "Data Representation by Deep Learning," online presentation, 2018. Li inconsistently used his cover affiliation in coauthored articles with his advisor. See, for example, Li Bicheng and Yin Hujun, "Face Recognition Using RBF Neural Networks and Wavelet Transform," in Jun Wang, Xiao-Feng Liao, Zhang Yi, *Advances in Neural Networks*, Springer, 2005; Li Bicheng, Huang Jie, and Yin Hujun, "A General Fuzzy Modeling Approach to Detection Decision Fusion," 2009 Fourth International Conference on Frontier of Computer Science and Technology, Shanghai, China, 2009a; Li Bicheng, Huang Jie and Yin Hujun,"Two Efficient Combination Rules for Conflicting Belief Functions," 2009 International Conference on Artificial Intelligence and Computational Intelligence, Shanghai, China, 2009b.

[130] Huaqiao University [华侨大学], undated-b.

Research Overview

Li Bicheng has conducted research on a wide range of topics related to emerging technologies (see Table 3.3). In his Huaqiao University profile, Li lists his technical specializations as including big data [大数据], AI [人工智能], knowledge mapping [知识图谱], machine learning [机器学习], deep learning [深度学习], and online public opinion monitoring and guidance [网络舆情监测与引导].[131] The last category is of particular interest, given Huaqiao University's status as a UFWD-subordinate university and its focus on targeting overseas audiences.[132]

Table 3.3. Evolution of Li's Research Agenda

Date	Research Focus
2000s	Computer vision, censorship
Early 2010s	Online sentiment analysis, understanding public opinion
By at least 2016 onward	Developing system for IO
By at least 2019	Leveraging AI for IO
2024	Interest in LLMs/generative AI

NOTE: LLM = large language model.

From our survey of Li's published works, it appears that his early research focused mainly on applications related to computer vision [计算机视觉], such as imagery analysis, text classification, and media interpretation. However, even during this initial stage, it appears that Li took a keen interest in research related to online information control. For instance, in 2005, he codeveloped a patent for a "system for blocking pornographic imagery and harmful online information" alongside personnel from Zhengzhou Jinhui Computer System Engineering Co.[133] This was reportedly part of the Chinese government's aborted Green Dam Youth Escort program, which was intended to install censorship software on all new computers in China starting in 2009, and Li garnered some domestic and foreign media attention for this effort.[134] Starting around 2009, Li began to focus more closely on research related to public opinion monitoring and guidance, filing two patents that year for software designed to extract

[131] Huaqiao University [华侨大学], "undated-b

[132] Huaqiao University [华侨大学], "Introduction to Huaqiao University" ["华侨大学简介"], webpage, undated-a.

[133] Zhao Huiqin [赵慧琴], Zhou Hui [周翬], Tang Huaili [汤怀礼], Li Bicheng [李弼程], Peng Tianqiang [彭天强], Cao Wen [曹闻], and Zhang Chenmin [张晨民], "System for Blocking Off Erotic Images and Unhealthy Information in Internet" [在互联网上堵截色情图像与不良信息的系统], Chinese patent number CN1761204A, filed November 18, 2005.

[134] Jonathan Watts, "China Backs Down Over Controversial Censorship Software," *The Guardian*, June 16, 2009.

information from online web forums and identify critical online statements.[135] The following year, Li published several articles on machine learning applications for public sentiment analysis.[136] This juncture appeared to mark a turning point in Li's research output, with his work becoming increasingly focused on topics related to public opinion guidance. Throughout the rest of the 2010s, Li published dozens of articles and a set of books on topics relating to online sentiment analysis.[137]

We date Li's interest in the potential offensive applications to between 2014 and 2016, moving beyond exclusively focusing on analyzing public opinion for the purposes of maintaining social stability. Specifically, we argue that Li's 2015 publication of a book on online public opinion sentiment analysis likely represented a culmination of that body of research.[138] Marking this shift, Li published his initial article in October 2016 outlining his vision for a system for influence operations, using his new affiliation with Huaqiao University.[139] It is worth noting, however, that this 2016 article was funded by his 2014 NSSF grant on "Modeling and Countermeasures of Online Public Opinion Warfare System," which was awarded while he was working for the PLA at IEU. Thus, it is possible his interest in these offensive applications dates to 2014 or even earlier.

Li's publishing output appears to have declined sharply after his 2016 move to Huaqiao University (see Figure 3.1). Interestingly, however, Li's decline in scholarly output appears to have coincided with a commensurate increase in practical research and development. Of the 42 patents that Li has drafted throughout his career, almost two-thirds were filed after he left IEU. Most of these patents are held by Huaqiao University, although a few are controlled by private companies, such as Jiangsu Testlink Space Big Data Application Research Center Co. [江苏测联

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[135] Li Bicheng [李弼程], Zhou Jie [周杰], Lin Chen [林琛], Chen Gang [陈刚], and Li Zhen [李真], "Network Criticism Oriented Viewpoint Subject Identifying Method and System" ["一种面向网络评论的观点主题识别方法和系统"], Chinese patent number CN101727487A, granted June 9, 2010; Li Bicheng [李弼程], Wang Yun [王允], Lin Chen [林琛], Guo Zhigang [郭志刚], and Yan Hongcan [阎红灿], "Web Forum Information Extraction System" ["一种 Web 论坛信息抽取系统"], Chinese patent number CN101727486A, granted June 9, 2010.

[136] Li Bicheng [李弼程], Lin Chen [林琛], Zhou Jie [周杰], "Research on the Patterns of Online Public Opinions About the State and Trend Analysis" ["网络舆情态势分析模式研究"], *Information Science* [情报科学], Vol. 28, No. 7, July 2010; Li Bicheng [李弼程], Lin Chen [林琛], Guo Zhigang [郭志刚], "Discussion About Research for Internet's Public Opinion of Sudden Events" ["突发事件网络舆情研究探讨"], *Journal of Intelligence* [情报杂志], Vol. 29, No. 7, July 2010; Zhou Jie [周杰], Lin Chen [林琛], Li Bicheng [李弼程], "Research of Sentiment Classification for Netnews Comments by Machine Learning" ["基于机器学习的网络新闻评论情感分类研究"], *Journal of Computer Applications* [计算机应用], Vol. 30, No. 4, April 2010.

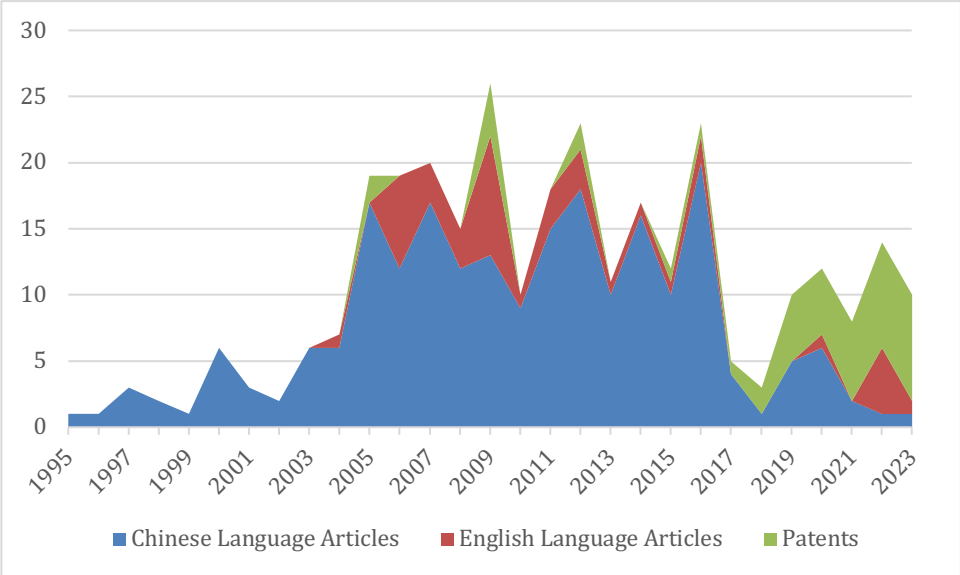
[137] For one key example, see Li Bicheng [李弼程], *Online Public Opinion Analysis: Theory, Technology, and Strategy* [网络舆情分析: 理论, 技术与应对策略], National Defense Industry Press [国防工业出版社], 2015.

[138] Li Bicheng [李弼程], 2015.

[139] Li Bicheng [李弼程], 2016.

空间大数据应用研究中心有限公司] and Xiamen Meiya Pico Information Co. [厦门市美亚柏科信息股份有限公司].[140] We address Li's collaboration with Meiya Pico in Chapter 6.

Figure 3.1. Li's Research Output



Li's Research Funding

Li has also received numerous Chinese government grants to support his research over the years (see Table 3.4). Of special importance are two grants from the NSSF (2014 and 2019), three from the National High-Technology Research and Development Program (commonly known as the 863 Program, with two in 2007, and another in 2011) and multiple grants from the Chinese military (2006 and another by at least 2023). At least some of Li's research is likely classified, based on partially redacted grant titles.

Table 3.4. Li Bicheng's Research Funding

Year	Funder	Grant Title	Amount (USD)
By at least 2023	[PLA] Equipment [Development Department] Preliminary Research–Ministry of Education Joint Fund	Unknown	Unknown
2022	Xiamen Industry-Academic-Research [Fund]	Research on Knowledge Discovery System of Online Social Media	35,000

[140] Wang Wei [王炜], Xu Xiaowen [徐晓文], Li Bicheng [李弼程], and Zhang Zhengdao [章正道], International Event Risk Deduction Method and Terminal" ["一种国际事件风险推演方法及终端"], Chinese patent number CN111310116A, filed December 30, 2019.

Year	Funder	Grant Title	Amount (USD)
2022	Horizontal cooperation projects	Research on Online Information Release Simulation Technology	150,000
2021	Horizontal cooperation projects	Research on Technology for Real-Time Identification of Harmful Information Under High Throughput	75,000
2019	NSSF Project	Research on Online Public Opinion Intelligent Guidance Simulation Deduction and System Modeling	30,000
2019	Horizontal cooperation projects	Research on Knowledge Discovery System of Online Social Media	160,000
2019	National defense preliminary research project	XXX Technology Research	700,000
2018	Horizontal cooperation projects	Research on intelligent Agent Technology Guided by Online Public Opinion	30,000
2018	Horizontal cooperation projects	Knowledge Graph and Its Application Research	83,000
2018	Xiamen Industry-Academic-Research Institute	Knowledge Graph and Its Application Research	38,000
2018	Horizontal cooperation projects	Research on Video Intelligent Recognition Technology	75,000
2017	Fujian Province Social Science Project	Research on Intelligent Agent Guiding Online Public Opinion Based on Cognitive Mechanism	7,000
2017	Horizontal cooperation projects	Internet topic event information extraction	44,000
2017	Horizontal cooperation projects	Information Extraction and Geospatialization of Online Public Opinion Events	155,000
2016	Horizontal cooperation projects	Internet + Renren Bus Management Platform	45,000
2016	Huaqiao University scientific research start-up project	Online Public Opinion Situation Mapping And Visualization Mining	195,000
2014	NSSF Project	Modeling and Countermeasures of Online Public Opinion Warfare System	33,000
2012	Provincial and ministerial level scientific research projects	Internet Information XXX System	760,000
2011	Provincial and ministerial level scientific research projects	Online Public Opinion XXX System Development and Maintenance	325,000
2011	National 863 project	XXX Threat Assessment Methodology Research	85,000
2011	Provincial and ministerial level scientific research projects	Online Public Opinion XXX System	263,000
2010	Major projects of the NSSF	Research on the Evolution Model and Simulation System of Emergency Online Public Opinion	90,000
2009	National Natural Science Foundation of China project	Video Semantic Vector Space Model and Bad Video Recognition	37,000
2007	National 863 project	Research on Key Technologies of Online Public Opinion Situation Analysis And Early Warning	125,000

Year	Funder	Grant Title	Amount (USD)
2007	National 863 project	Massive Speech Recognition Integrated Processing System	116,000
2007	Provincial and ministerial level scientific research projects	XXX Information Processing Application Component Development	170,000
2006	National defense preliminary research project	Intelligent Processing Technology of XXX Information (Graphic Image Part)	125,000
2005	Major projects of the Ministry of Information Industry	Telecom Network XXX System Subitem	80,000

SOURCE: RAND research drawn from Li's Huaqiao faculty biography, Chinese government research grant databases, and funding information provided in Li's published articles.
NOTE: U.S. dollar is adjusted for exchange rate average by year of funding.

Understanding His Midcareer Move in 2016

We offer two potential explanations for Li's 2016 move, both with key implications for understanding the broader Chinese Party-state's evolving approach to social media manipulation. First, one explanation is that Huaqiao University (and thus likely the UFWD) recruited Li to bring his leading computer science expertise to improve the university's relatively meager existing capabilities on a topic that is increasingly important for the entire Chinese Party-state system. This would suggest that the PLA and UFWD cooperated, or at least coordinated, with tacit PLA approval for the UFWD developing improved capabilities and a likely expectation that Li could continue supporting PLA efforts at the same time. For this argument, our key piece of evidence is the continuity of Li's research after his move and Huaqiao's broader integration with Chinese national security efforts.

Second, an alternative explanation is that, as the PLA created the PLASSF in late 2015 and began to realize its organizational vision as a synergist hub for the fusion of cyber-enabled influence operations, Li's research at PLA IEU was identified as the most promising, and he was secretly deployed to Base 311 to support operationalizing a social media manipulation capability, with his affiliation at Huaqiao University as his cover. For this argument, our key piece of evidence is a 2019 article on leveraging AI for online public opinion struggle that he coauthored with a Base 311 researcher.[141]

We considered two other possibilities but find them unlikely for various reasons. First, Li Bicheng could have individually decided to leave the PLA and move to Huaqiao University. However, his 2019 coauthored publication with Base 311 and the award of a PLA research grant sometime before 2023 (likely 2021 or 2022) strongly suggest that he certainly did not leave the PLA on bad terms and, much more likely, found a way to maintain some amount of positive ties with the PLA. Second, Huaqiao University could have pursued Li without UFWD or PLA

[141] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], "Intelligent Agent Model for Online Public Opinion Guidance" ["网络舆情引导智能代理模型"], *National Defense Technology* [国防科技], June 2019.

direction or approval, solely to improve the university's academic offerings and research capacity. However, Huaqiao's direct responsibility under UFWD and apparent push to better integrate with PRC defense ecosystem make this unlikely. Another explanation we did not consider deeply is that Li was caught up in the PLA reorganization that created the PLASSF.[142]

Supporting Cross-Party-State Collaboration

At first glance, Li's decision to work at Huaqiao University is puzzling, especially given his computer science background and prior status as a defense academician. For instance, Li's current role as a faculty member at Huaqiao University is arguably less prestigious than the one he enjoyed at the PLA's IEU, which almost certainly boasted a larger funding pool and substantially better-resourced computer engineering program. Moreover, the fact that almost all of Li's previous work was spent embedded within PLA research institutions makes his midcareer switch to a civilian role appear particularly odd.

Huaqiao University [华侨大学], literally translated as "Overseas Chinese University," is a national-level university that is openly operated and supervised by UFWD, although it likely has some informal connections to the Chinese military.[143] The school was founded in 1960, with its main campus being located in Xiamen, Fujian Province.[144] As its name suggests, Huaqiao has a strong international focus, with deep ties to areas outside the Chinese mainland, such as Hong Kong, Macau, and Taiwan. The school boasts a student body of more than 27,000 undergraduate students; 7,300 postgraduates; and 2,900 teaching staff.[145] According to the school's website, 57 percent of its teaching staff hold "senior professional or technical positions" [高级专业技术职务者], and 100 are classified as having "national leading talents" [国家领军人才等高层次人才].[146] Crucially, Huaqiao also hosts a number of specialized facilities focused on cultivating technical staff, such as its Information Technology, a "National and Local Joint Engineering Research Center" [国家地方联合工程研究中心] and "National 111 Plan Smart [Technology] Talent Innovation Base" [国家 '111 计划' 学科创新引智基地].[147] Although Huaqiao does not have direct institutional ties to the PLA, there is ample circumstantial evidence to suggest that it maintains a working relationship with China's military. For instance, the school has received visits from provincial CCP leadership for its role in promoting military-civil fusion [军民融合] in such areas as talent cultivation and technological research and appears to be fast-tracked to

[142] The authors thank John Chen for this point.

[143] Joske, 2020; Huaqiao University [华侨大学], "Overview" ["华大概况"], webpage, undated-c.

[144] Huaqiao University [华侨大学], undated-c.

[145] Huaqiao University [华侨大学], undated-c.

[146] Huaqiao University [华侨大学], undated-c.

[147] Huaqiao University [华侨大学], undated-c.

becoming affiliated with China's National Defense Science and Industry Bureau [国防科工业局].[148] Huaqiao University's international focus likely supports Li's work for externally focused influence operations, likely an improvement over the relatively reclusive IEU.

A closer examination of Li's role at Huaqiao University sheds some light on this apparent mystery. Most notably, Li's faculty biography lists him as being a "subject-matter direction leader" [学科方向带头人], a term which strongly suggests that his role at the Huaqiao University is not limited to teaching but also entails resourcing and directing a research cluster focused on AI application research.[149] This hypothesis is borne out by Li's subsequent work at Huaqiao University. For instance, in 2021 he collaborated with other Huaqiao University faculty to establish the "Key Laboratory for Computer Vision and Machine Learning" [计算机视觉与机器学习福建省高校重点实验室] for Fujian Province, which conducts research and development of applications relating to smart manufacturing [智能制造], the intelligent internet of things [智能物联网], and online media big data analysis [网络媒体大数据分析].[150]

The exact extent of Li Bicheng's ongoing collaboration with his former colleagues in the PLA remains unclear, although it appears that he maintains close ties with elements of China's defense industrial base. Li appears to be unique among his peers at Huaqiao University's School

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[148] Huaqiao University [华侨大学], "A Delegation from the Provincial Party Committee's Military-Civil Fusion Office Came to the School for Investigation" ["省委军民融合办一行来校调研"], webpage, March 1, 2023; Huaqiao University [华侨大学], "Our Institute Participated in the Preparatory Meeting for the Special Docking Work of Fujian Province's Military-Civil Fusion Project" ["我院参加福建省军民融合项目专场对接工作筹备会"], webpage, March 1, 2018.

[149] In PRC academic nomenclature, *subject-matter direction leader* appears to be a common term of art referring to a senior academician who has a role in recruiting talent. These scholars appear to play a major role in determining department funding and resource-allocation decisions, as well as advising on the formulation of local government five-year plans. According to materials released by other universities, key selection criteria for subject-matter direction leaders include being of "good political and ideological quality and loyalty to Party education priorities" [政治思想素质好，忠诚党的教育事业], having "strong research capabilities and influence within academic circles" [良好的学术研究能力和学术影响力], and having a "strong organizational and coordination capability" [较强的组织协调能力]. See, for example, "Methods for Selection of Subject Matter Direction Leaders and Direction Team Leaders of Mechanical and Power Engineering (Trial)" ["机械与动力 best365 网页版登录学科方向带头人及方向团队负责人选拔办法 (试行)"], Chongqing University of Science and Technology, June 2, 2022; Hunan University of Humanities, Science and Technology [湖南人文科技学院], "Social Work Discipline 14th Five-Year Construction and Development Plan (2021–2025)" ["社会工作学科十四五建设发展规划（2021–2025)"], webpage, June 24, 2021.

[150] Gao Zhenguo [高振国] and Chen Yan [陈岩], "The Academic Committee of the Fujian Provincial Key Laboratory of Universities in Computer Vision and Machine Learning Was Established and the First Academic Committee Meeting Was Held" ["计算机视觉与机器学习福建省高校重点实验室学术委员会成立 第一次学术委员会会议召开"], Huaqiao University [华侨大学], October 2, 2021; Gao Zhenguo [高振国], and Chen Yan [陈岩], "Relying on the Construction of Our School, the Fujian Provincial Key Laboratory of Computer Vision and Machine Learning Established an Academic Committee and Held Its First Meeting" ["依托我校建设 计算机视觉与机器学习福建省高校重点实验室成立学术委员会并召开第一次会议"], Huaqiao University [华侨大学], October 2, 2021.

of Computer Science in that he is the only staff member we could identify who possesses a military background. Moreover, Li appears to be actively engaged as a civilian faculty and administrative member, suggesting his position is not ceremonial.[151] At the same, however, Li has continued to copublish with personnel affiliated with PLA outfits, such as Base 311.[152] Moreover, Li's role in expanding Huaqiao University's AI research department, coupled with the school's expanding role in promoting military-civil fusion and proximity to Base 311, strongly suggests that he is involved in fostering talent and platform development intended to aid the PLA. Finally, his research grant from the PLA Equipment Development Department's Preliminary Research Fund sometime before 2023 strongly suggests Li has maintained ties with the PLA.

Under this explanation, the UFWD decided sometime before 2016 that it wanted to improve its cyber-enabled influence operations and decided that Huaqiao University would be a good hub for building this research and development effort. It is possible the UFWD coordinated directly with the PLA or that Huaqiao took the initiative on personnel recruitment after receiving this high-level guidance. It is also possible that Huaqiao University poached Li, perhaps offering him a higher salary or greater leeway to collaborate with external companies. Either way, this would entail some amount of UFWD-PLA coordination and likely more-substantive cooperation than previously understood, especially on this topic. Further research into UFWD efforts on social media manipulation would shed more light on how this notional timeline fits into its broader efforts.

Driving PLA Operationalizing Online Public Opinion Guidance Capabilities

The second possible explanation for Li's move is ultimately the story of the PLASSF (now PLACSF) and the PLA's embrace of social media manipulation as a deployed operational capability. Under this explanation, two threads converge: the PLA's desire to conduct social media manipulation and Li's emerging expertise on the topic. Li's move to Huaqiao University would be a cover for his covert support to Base 311, since Huaqiao University is located just a couple hours' drive from Base 311.

The PLA likely decided to operationalize social media manipulation around the time of Li's move, so the timing fits well. Working backwards from the available evidence of PLA social media manipulation efforts, the PLA, specifically the PLASSF, was first credibly accused of social media manipulation by Taiwan during its 2018 elections.[153] Previous research has

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[151] Cai Xinyu [蔡新宇], "'Applied Statistics and Data Science Forum' Was Held in Our School" ["'应用统计与数据科学论坛'在我校举办"], Huaqiao University [华侨大学], July 16, 2019; Huaqiao University [华侨大学], "Teaching Staff" ["师资队伍], webpage, undated-d; Huaqiao University [华侨大学], 2020.

[152] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[153] Chien Li-chung, Chung Li-hua, and Jonathan Chin, "China Using Fake News to Divide Taiwan," *Taipei Times*, September 16, 2018; Chung Li-hua and William Hetherington, "China Targets Polls with Fake Accounts," *Taipei Times*, November 5, 2018; Jason Pan, "China Subverting Elections: Premier," *Taipei Times*, November 2, 2018.

identified that Base 311 was almost certainly preparing for this effort by at least 2018, and other parts of the PLA very likely conducted research by at least 2017.[154] Assuming some lead time for senior PLA and perhaps Chinese civilian leadership to approve this effort, a decision by 2016 that set the stage for Li's move is possible. Another line of reasoning supports an even earlier high-level PLA decision: One interpretation of the PLASSF's creation in December 2015 is that cyber-enabled influence operations are exactly what PLASSF was intended to conduct. As a 2023 RAND report argued, the PLASSF's creation may have

> reflected a desire to better leverage the synergies across the four mission areas, including cyber and psychological capabilities, for strategic effects. [Under this potential explanation], an ideal fusion of PLASSF missions would be employing PLA cyber capabilities to achieve information dominance and then generating such psychological effects that an adversary leadership decides not to fight.[155]

This would mean that the PLA leadership had already decided by at least 2015 that the PLASSF and likely Base 311 would be responsible for improved cyber-enabled influence operations. Again, this timing would fit neatly with Li's move.

Accepting this notional bureaucratic momentum, the PLA still had to find the right person for the job, and, under this explanation, Li was selected. It is possible that Li's relevant research in the early 2010s garnered enough attention to make him the standout candidate for the position. Given his position at IEU, he was already within the (newly created) PLASSF, so he would have been much easier to identify. He had already worked on a number of sensitive, and likely classified, Chinese military and broader government research projects before, so he would have been much easier to trust. And he had just received a NSSF grant in 2014 on "Modeling and Countermeasures of Online Public Opinion Warfare System," which is exactly what he would have been asked to build. And Li was advocating for change within the PLA, as a 2016 article criticized the PLA IO workforce as "insufficient numbers, poor quality, and unreasonable structuring," a sentiment that may well have been shared by PLA leadership.[156]

Under this explanation, the proof would also be an immense slipup of operational security. In June 2019, Li and one of his graduate students at Huaqiao University coauthored an academic article in one of the PLA's top journals, *National Defense Technology*, with a Base 311 researcher, which extended Li's earlier work on social media manipulation (explained in detail in

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[154] For analysis, see Beauchamp-Mustafaga and Drun, 2021. For the two original PLA. Articles, see Liu Huiyan [刘惠燕], Xiong Wu [熊武], Wu Xianliang [吴显亮], and Mei Shunliang [梅顺量], "Several Thoughts on Promoting the Construction of Cognitive Domain Operations Equipment for the Omni-Media Environment" ["全媒体环境下推进认知域作战装备发展的几点思考"], *National Defense Technology* [国防科技], October 2018; Lai Dongwei [赖东威], "An Analysis of the Minnan Language Sentence Patterns and Vocabulary Used on Taiwanese Social Media" ["台湾社交媒体的闽南语句式和词汇使用现象探析"], *News Research* [新闻研究], November 2017.

[155] Beauchamp-Mustafaga, 2023a. For an earlier version of this argument, see McReynolds and Costello, 2018.

[156] Li Bicheng [李弼程], 2016.

Chapter 4) to leverage AI.[157] This would very neatly illustrate his support to Base 311's efforts to operationalize the PLA's social media manipulation. However, the fact that the article was publicly available would also go against the idea that Li's Huaqiao position was a cover for his secret support to Base 311. It is possible that Li and his Base 311 coauthor were under the assumption that the article being published in a PLA-focused journal would be sufficient to hide Li's relationship with Base 311 from public scrutiny, despite the article being publicly available. Although this would mean that Li exhibited incredibly poor operational security, giving slightly more credence to this potential ignorance is that Li used both his actual affiliation (IEU) and cover affiliation (Zhengzhou Information Science and Technology Institute) while he was engaged with foreign academics.

Taking Stock

We argue that the more likely explanation is that Li moved to Huaqiao to covertly support PLA efforts to stand up its social media manipulation capability at Base 311, although that ultimately does not change Li's importance either way. We may never know the full story. A hybrid explanation—that Li maintained his PLA ties and served as a consultant for Base 311 as needed while focusing on building up a research program to support Huaqiao's efforts—is also possible because these are not mutually exclusive.

Conclusion

Regardless of Li's specific arrangement with Huaqiao University and the PLA, Li is clearly a well-connected Chinese military-affiliated researcher who receives continued Chinese government and military funding for his research on topics that, as we will explore in the following chapters, are highly relevant to social media manipulation. The next chapter details Li's vision for a system for social media manipulation.

[157] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

Chapter 4. Li Bicheng's Vision for Artificial Intelligence–Driven Online Influence Operations

Li has spent the past ten years envisioning and developing an operational capability for the Chinese government to conduct online influence operations, including social media manipulation targeting foreign platforms. Our research suggests Li began working on this capability perhaps as early as 2014 and publicly released his early vision in 2016. In 2019, Li embraced AI-driven social bots as a key part of realizing his vision for a comprehensive system for online public opinion guidance.

This chapter documents the details of Li's vision, including the operational problem he is trying to solve, his research agenda, his explanation of this social media manipulation process, the capability requirements he outlines, and the innovative simulations he is developing.

Li's View of Current Shortcomings in Chinese Social Media Manipulation

The problem Li was attempting to address was that, although China (and, very likely, the PLA specifically) had embraced sock puppet accounts, this was still not done at sufficient scale. In his 2019 article that embraced AI, Li criticized China's "traditional modes . . . that use mechanized sock puppet [马甲] posting" as "featuring a low level of intelligentization and poor results."[158] Specifically, Li identified three problems. First, PLA IO content was not sufficiently authentic, making it too easy to identify: "Post [content] generation is mechanized without regard for personality, occupation, and age differences. There is no individuality or simulation of human characteristics, so posts are easily identified [识别] and deleted [封杀]."[159] Second, content delivery was not optimized: "There is no adaptive selection of guidance timing and method and no self-learning or self-organizing functions, which leads to singular guidance and control methods and the direct delivery [publication] of posts."[160] Third, this activity was not coordinated across actors (likely meaning multiple humans): "Guidance is generally independent, featuring no interactivity or coordination, leading to suboptimal guidance results."[161] Given the fact that Li was coauthoring with a researcher at the PLASSF NSD (now

[158] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019. Li repeated this in his 2020 article. See Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[159] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[160] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[161] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

PLACSF) Base 311 in 2019, this may well have been an acknowledgement of Base 311's shortcomings for its social media manipulation against Taiwan's 2018 elections.[162]

This view continued through at least early 2023. As an early 2023 article Li coauthored explains, "in the field of online public opinion guidance, it is necessary to respond to this explosion of information by automatically generating a large number of posts"—that is, the rise of public discussion on the internet now requires the CCP to extend its guidance (control) of public discourse (and thus public opinion) to online spaces, at a large scale.[163] However, the problem, according to Li, is that "artificial posting is not very efficient, and the text quality of speech repetition and rules-based generation is quite low, which makes it difficult to achieve guidance goals,"—that is, the CCP's ability to generate text without human labor (50 Cent Army) is relatively weak because it is easy to identify.[164] This is a damning indictment of more than 15 years of Party-state efforts to guide (control) online public opinion. Li is likely highly informed about their performance and, in essence, is calling past efforts of little value.

Another problem, in Li's view, is that China's capabilities are lagging behind those of the United States and other global powers. In his 2019 article, Li argues that "global superpowers have all strongly emphasized online public opinion struggle."[165] The importance of progress for China is reinforced as Li argues that other countries have already "incorporated online public opinion struggle capabilities into the construction of their national and military capability systems to give priority to research in this area and improve their strengthening."[166]

Designing a Human Role in Li's AI Vision

AI and *intelligentization* can mean may different things to many different people. Li's embrace of AI was intended to reduce or even eliminate the requirement for human labor in most of the social media manipulation process but still featured a human oversight role. The key step in 2019 was his recognition that AI could reduce or replace human role in content creation and content delivery.[167] This would be accomplished by automating these two parts of the influence

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[162] For more on this, see Beauchamp-Mustafaga and Drun, 2021. This may have also been a criticism of PLA Rear Admiral Luo Yuan's idea of a "volunteer army" for public opinion warfare, which Li references in his 2019 article. See Luo Yuan [罗援], "Build an Internet 'Volunteer Army' and Stick to the 'Shangganling' of Public Opinion: Some Thoughts on Launching Cyber Warfare and Fighting a Good Public Opinion War" ["打造网络'志愿军,'坚守舆论'上甘岭': 开展网络战，打好舆论战的几点思考"], *China Information Security* [中国信息安全], April 2016.

[163] Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], "Affective Text Generation with Hard Constraints" ["硬约束限制的情感文本生成方法研究"], *Application Research of Computers* [计算机应用研究], January 2023.

[164] *50 Cent Army* is the nickname for Chinese propagandists who were once reportedly paid 50 cents per comment they posted online.

[165] Li Bicheng [李弼程], 2016; Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[166] Li Bicheng [李弼程], 2016.

[167] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

operation by leveraging models to produce the desired content and then optimize delivery. Because Li embraced AI-driven bots by at least 2019, this is also reflected in his abandoning of calls for cultivating influencers (the PLA calls these *opinion leaders* or *Big Vs*), which were previously included in his original 2016 vision.[168] However, Li still plans for humans to have a leading role by giving orders to start the process and being able to monitor the results.

In embracing automation, Li thus also has to design human interaction via the command and control center to ensure Party control over the entire system, even if the human is removed from the actual employment. Li explains in his 2019 article that the center is "primarily responsible for collecting public opinion information and conducting comprehensive data analyses."[169] This includes a "public opinion analysis–based index system" [舆情态势分析的指标体] that provides "information support" by "analyzing and evaluating the public opinion situation, while also providing a visual display."[170] This focus on generating a visual display clearly reveals a desire for human involvement and even oversight of the process.

A key question, however, will be how much human involvement in content creation the PLA and broader Party state require; content creation has so far proven very sensitive for the Party.[171] Previous research on other aspects of PLA adoption of AI suggests a general interest in ensuring human involvement, but the details matter and are unavailable in this case.[172] Given PLA ideological concerns about negative influence from Western social media, and, therefore, likely concerns about PLA personnel using Western social media to conduct IO, it is possible that automating this activity would also be reassuring to the PLA's ideological sensibilities to avoid its personnel being directly exposed to foreign content.[173]

Li's Research Agenda: Theorizing and Operationalizing Online Public Opinion Guidance

Li sets forth an ambitious objective for his research to support the whole development process for PLA public opinion warfare, from theory to operationalization. In 2019, he wrote that this research would "be of important theoretical significance and application value in terms of

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[168] Li Bicheng [李弼程], 2016; Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[169] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[170] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[171] Marcellino et al., 2023.

[172] Elsa Kania, "Artificial Intelligence in Future Chinese Command Decision Making," in Nicholas D. Wright, ed., *Artificial Intelligence, China, Russia, and the Global Order*, Air University Press, 2019; Zi Yang, "How China Leverages Artificial Intelligence for Military Decision-making," in Roy D. Kamphausen, ed., *China's Military Decision-Meaking in Times of Crisis and Conflict*, National Bureau of Asian Research, 2023. For a Chinese government statement on human involvement in AI for military purposes, see MFA, "Position Paper of the People's Republic of China on Regulating Military Applications of Artificial Intelligence (AI)," December 14, 2021.

[173] The authors thank John Chen for this point.

enriching Chinese public opinion warfare theory, developing online public opinion warfare weapons and technology, and achieving the public opinion advantage in future informationized wars."[174] This marks an update from Li's original 2016 vision, which was to "establish a model for a system for online public opinion struggle from a technological perspective."[175] The goal, in Li's words, was to develop "an operational system with integrated intelligence, guidance, attack, protection, and evaluation."[176]

While Li is an incredibly prolific author across the entire gamut of AI and machine learning—as if he were being added as lead author to the output of many teams of students and junior researchers—we detected an overarching research thread supporting automated influence operations in his larger body of published work, based on our review of his over 260 total Chinese and English-language articles (as of late 2023). In this stream of research, he is focused on influence writ large (doctrine for conducting online influence operations) and on how to operationalize that doctrine in military operations (influence as a warfighting function for the PLA). Table 4.1. presents an overview of select publications on influence.

Table 4.1. Selective Overview of Li's Influence-Related Research

Year	Paper	Research Topic	Category
2016	*Model for a System of Online Public Opinion Struggle and Countermeasures* (Li Bicheng [李弼程], 2016)	Develop an operating concept for influence operations	Doctrine & operating concepts
2017	*A Brief Introduction of All Domain Integrated Joint Operations for Online Public Opinion Struggle* (Li Bicheng [李弼程], 2017)	Develop a theory of joint IO	Doctrine & operating concepts
2019	*Cognitive Mechanism Analysis of Online Public Opinion* (Li Bicheng [李弼程], 2019)	Netcentric, cognitive analysis of influence	Influence diffusion
2019	*Intelligent Agent Model for Online Public Opinion Guidance* (Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019)	End-to-end AI influence systems	Automated influence
2020	*Fuzzy-Synthetical Evaluation of Online Public Opinion Guidance* (Xiong Yao [熊尧], Li Bicheng [李弼程], and Wang Ziyue [王子玥], 2020)	Assessing the effectiveness of public opinion guidance	Influence assessment
2020	*Simulation Deduction Model and System Construction of Intelligent Online Public Opinion Guidance* (Li Bicheng [李弼程], 2020)	Simulation environments for the development and test AI influence systems and components	Automated influence

[174] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[175] Li Bicheng [李弼程], 2016.

[176] Li Bicheng [李弼程], 2016.

Year	Paper	Research Topic	Category
2022	*Dynamic Network Representation of Information Diffusion Based on Relationship Strength Theory and Feedback Mechanisms* (Pan Le [潘乐], Li Bicheng [李弼程], et al., 2023)	Better dynamic modeling of network information diffusion	Influence diffusion
2023	*Affective Text Generation with Hard Constraints* (Li Bicheng [李弼程], 2023)	Affective variation in content generation without loss of message fidelity	Content generation

The Solution

Li proposes in his 2019 article to design a "self-learning, self-organizing intelligent agent model for online public opinion guidance," thus "achieving intelligent online public opinion guidance."[177] This model would be able to "generate posts, select the timing and guidance tactics, and coordinate the guidance [activity . . .] with multiple other intelligent agents."[178] Moreover, the model would be able to "automatically adjust guidance strategies according to the development of online public opinion in order to enhance its [performance]."[179] The purpose, as Li explains, is to "solve the real problems restricting China in online public opinion struggle," clearly illustrating that Li's proposal is intended to be implemented to benefit China by influencing global public opinion.[180] Li's 2020 article explains that "online public opinion intelligent agents" are designed to "achieve intelligent, high-performance online public opinion guidance," as we explain next.[181] While Li's 2019 and 2020 articles do not provide much detail on where he would deploy this capability, his 2016 article lists a broad range of mediums, from text messages to instant messaging services to online forums to social media.[182] We are most interested in social media, but it is important to note that his targets go beyond that.

How It Works

Li helpfully lays out a six-step process for public opinion struggle. In essence, this progresses from information inputs to content creation to content delivery. Figure 4.1 reproduces Li's process.

[177] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[178] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

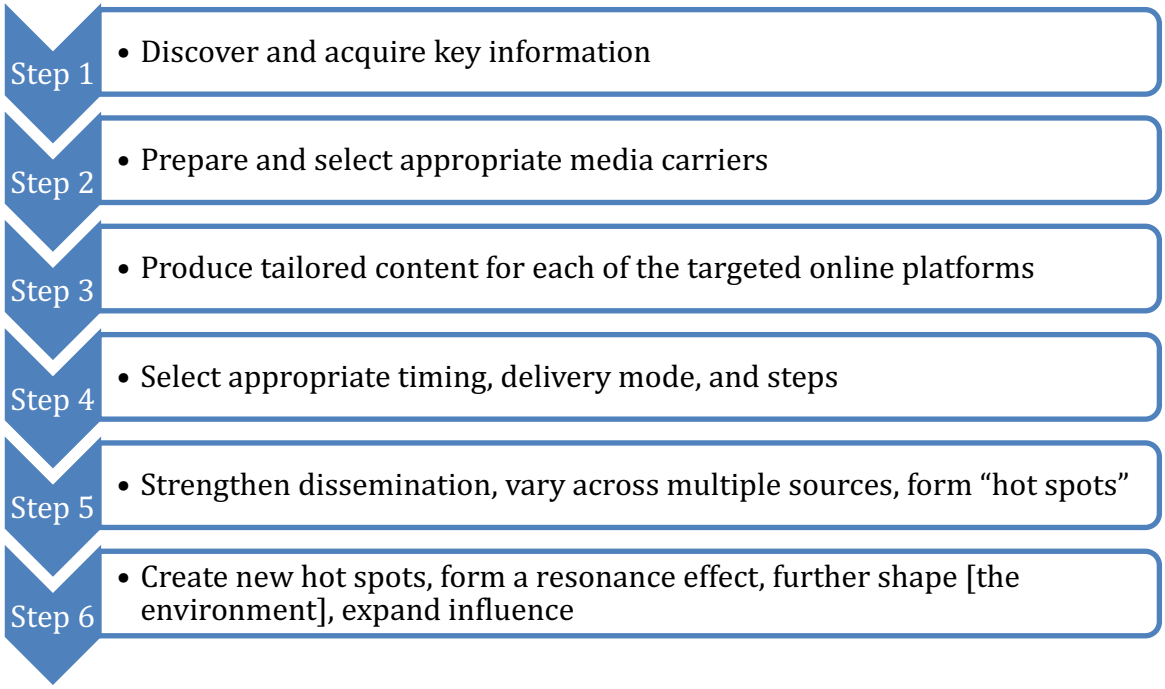
[179] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[180] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[181] Li Bicheng [李弼程], Xiong Yao [熊尧], Huang Tao [黄涛], and Pan Le [潘乐], "Simulation Deduction Model and System Construction for Intelligent Online Public Opinion Guidance" ["网络舆论智能引导仿真推演模型与系统构建"], *National Defense Technology* [国防科技], October 2020.

[182] Li Bicheng [李弼程], 2016.

Figure 4.1. Li's 2016 Process for Online Public Opinion Struggle



SOURCE: Adapted from Li Bicheng [李弼程], 2016.

Li's later research refined this process and added a new step, *coordination*.[183] First, the system will be able to "receive public opinion situation and guidance orders from the command and control center."[184] Second, the system will be able to "select appropriate post generation models based on the topic, style, and emotional tone set by guidance orders and generate posts with certain character traits."[185] The 2020 article similarly explains the AI-driven system will have the ability "to set the theme, style, and tone of a post; select appropriate post generation models; and generate posts with the attributes of a specific person according to guidance orders."[186] Third, the model will be able to "adjust guidance timing and methods based on current online public opinion."[187] Fourth, the model will be able to "push posts and conduct public opinion guidance based on set behavioral characteristics and guidance timing and methods."[188] Fifth and finally, it will be able to "carry out coordinated online public opinion

[183] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019; Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[184] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[185] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

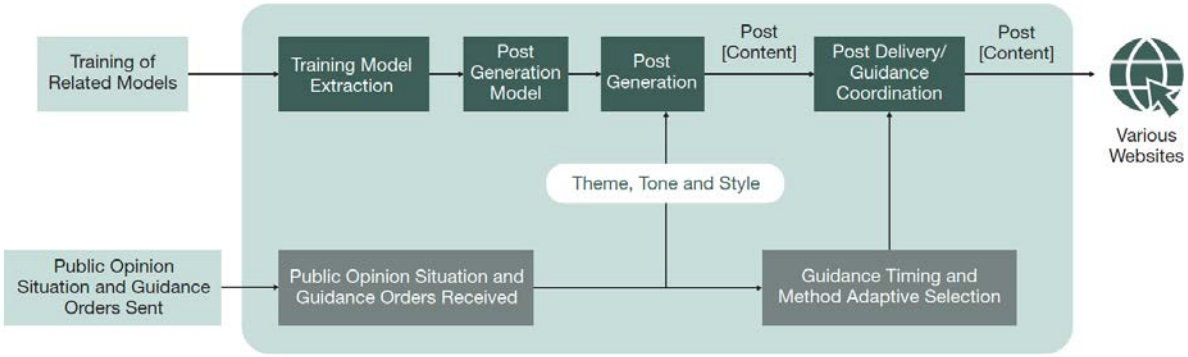
[186] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[187] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[188] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

guidance between multiple intelligence agents."[189] Li's 2020 article provides a visual depiction of this model, translated in Figure 4.2, that features a set of inputs (AI modeling and CCP objectives) that drive post (content) generation and post timing (delivery) mechanisms for what is posted on social media.

Figure 4.2. Li's 2020 Vision for AI-Driven Social Media Manipulation



SOURCE: Adapted and translated from Li et al., 2020. Reproduced from Marcellino et al., 2023.

Requirements

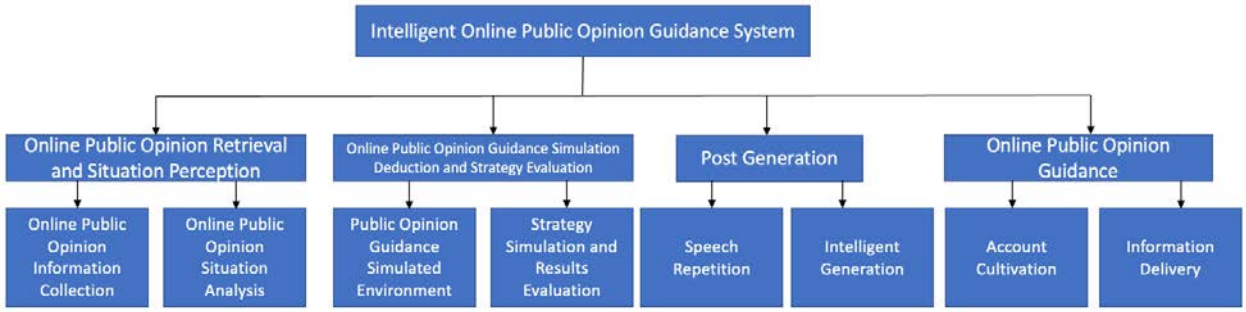
Over the course of his career, Li has specifically identified a range of underlying capabilities and other requirements that are needed to realize his vision. Li's 2016 article lays out seven equipment requirements for his early vision before he really focused on AI: public opinion monitoring and guidance, censorship, content creation, content delivery, efficiency evaluation, a command-and-control interface, and database management.[190] This evolved further into 2020.[191] Figure 4.3 diagrams these requirements, based on his 2020 article, and how they relate to one another.

[189] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[190] Li Bicheng [李弼程], 2016.

[191] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

Figure 4.3. Li's 2020 Diagram of Requirements for His Model



SOURCE: Adapted from Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

We provide more details on each requirement here, based on Li's 2016 article:[192]

1. *Online public opinion surveillance and guidance* [网络舆情监测与引导]. For monitoring public opinion, Li identifies the ability to do big data mining and processing and the ability to provide decisionmaking suggestions via early warning (differentiated by severity) and public opinion situation display. For online public opinion guidance, Li lists several tactics: "agenda setting" [设置议程], "speaking with one voice" [统一口径] and "setting regulations" [制定规范]. Li seeks to be able to tailor the content based on online public opinion dissemination characteristics [网络舆情传播特点] and netizen psychological characteristics [网民心理特征].
2. *Undesirable online information blocking* [网络不良信息封堵]. Li seeks to be able to conduct "real-time surveillance" and early warning of "enemy" "online public opinion offensives." The objective is to "block undesirable and harmful information" through specific tactics such as domain name blocking, uniform resource locator (URL) blocking, transmission control protocol (TCP) packet interference, and content filtering.
3. *Online public opinion information production* [网络舆论信息制作]. Li's vision is to "plan and produce" content based on the specific target audience's characteristics as what Li refers to as "ammunition" [弹药] for PLA operations. Li identifies specific technologies, such as "speech synthesis technology" [语音合成技术], "image and video stitching technology" [图像/视频拼接技术], and "multi-media camouflage technology" [多媒体伪装技术]. Li explains the purpose of these technologies is to "generate the target person's voice, specific background, specific [visual] scene" and to "form multimedia information with images, text, and sound." This aligns with other PLA research about manipulating information to influence target audiences.[193]
4. *Large-scale online information delivery* [大规模网络信息投送]. Li seeks to conduct large-scale "online public opinion propaganda" [网络舆论宣传] toward the target audience via several types of media: text messages, emails, forums, instant messaging tools, microblogs (such as Sina Weibo), and social media platforms. This is a very broad

[192] Li Bicheng [李弼程], 2016.

[193] Beauchamp-Mustafaga, 2023a.

aperture for targets, and Li has also specifically mentioned Twitter and Facebook in other articles.[194]

5. *Online public opinion struggle efficiency evaluation* [网络舆论斗争效能评估]. This is intended to "evaluate operational results" and "improve decisionmaking." This aligns with a broader PLA desire for assessing the results of its operations, including for public opinion warfare.[195]
6. *Online public opinion struggle command and control* [网络舆论斗争指控]. This command center would send and receive information, support both "comprehensive and

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[194] Li Bicheng [李弼程], 2017.

[195] For other PLA writings on assessing public opinion warfare effectiveness, see Wu Jieming [吴杰明] and Yang Hongzhang [杨红章], "Basic Practices of U.S. Military Image Communication and Its Implications for Our Military" ["美军形象传播的基本做法及对我军的启示"], *Theoretical Studies on PLA Political Work* [军队政工理论研究], February 2007; Zhu Zhi [朱志], "A Study on Effect Evaluation of Public Opinion Warfare Model Based on Transmission Dynamics Theory" ["运用传播动力学理论建立舆论战效果评估模型"], *National Defense Technology* [国防科技], January 2010; He Yucheng [何玉诚], "The Research of the Control of Negative Public Opinion During War Time" ["战时不利舆论信息管控研究"], master's thesis, National University of Defense Technology [国防科学技术大学], November 2010; Wu Jie [伍杰] and Liao Dongsheng [廖东升], 2014; Zhao Yanqiu [赵艳秋] "Evaluation of the Effectiveness of Dismantling Enemy Forces During the Agrarian Revolution" ["土地革命时期瓦解敌军工作效果评估"], *Literature on Party Building* [党史文苑], April 2015; Quan Yong [全拥], "Research on Influence Analysis in Social Networks" ["面向社交网络的影响力分析关键技术研究"], doctoral dissertation, National University of Defense Technology [国防科学技术大学], October 2019; Zhong Xingrui [仲星睿], "A Study of U.S. Military Public Diplomacy Since the New Century ["新世纪以来美国军事公共外交研"], master's thesis, National University of Defense Technology [国防科学技术大学], December 2020.

For PLA research into effectiveness evaluation for psychological warfare, see Liao Dongsheng [廖东升], "Characteristics and Methods of the U.S. Military's Psychological Warfare Effectiveness Evaluation" [美军心理战效果评估方法与 特点], *National Defense Technology* [国防科技], April 2006; Liao Dongsheng [廖东升] and Li Ganqiang [李干强], "Current Status and Development Trends of Research on Psychological Warfare Effect Evaluation at Home and Abroad" ["国内外心理战效果评估研究现状及发展趋势"], *Hunan Social Sciences* [湖南社会科学], March 2007; Wang Furong [王芙蓉], Ou Lishou [欧立寿], and Liao Dayan [廖达炎], "Preliminary Study on the Psychological Warfare Effectiveness Evaluation Index System" ["心理战效能评估指标体系初探"], *National Defense Technology* [国防科技] May 2007; Liao Dongsheng [廖东升], Shen Yongping [沈永平], Chen Yinwu [陈英武], "Research on Effectiveness Evaluation of Psychological Operations Based on Multiple-Agent Modeling and Simulation Method" ["基于多 Agent 的心理战效果评估方法研究"], *Operations Research and Management Science* [运筹与管理], December 2007; Liao Dongsheng [廖东升], *Agent-Based Psychological Warfare Effectiveness Evaluation Methods* [基于 Agent 的心理战效果评估方法], Military Science Press [军事科学出版社], 2011; Zhu Zhi [朱志], Liu Fengjian [刘凤健], and Liao Dongsheng [廖东升], "Research on Psychological Warfare Effect Evaluation Model Based on Communication Dynamics" ["基于传播动力学的心理战效果评估模型研究"], *Theoretical Studies on PLA Political Work* [军队政工理论研究], February 2012; Liao Dongsheng [廖东升], *Research on Evaluation Method and Application of Effects of Psychology Operation Based on Multi-Agent* [基于多智能体的心理战效果评估方法], Military Science Press [军事科 学出版社], 2016; Huang Peng [黄鹏], Hua Honghu [华宏虎], and Wang Hao [王皓], "Psychological Warfare Effectiveness Evaluation Based on Big Data" [大数据视角下的心 理战效果评估], *National Defense Technology* [国防科技], Vol. 40, No. 4, April 2019; Liu Bin [刘玢], Cheng Gong [程功], Mao Liwei [毛立伟], "Establishment of an Evaluation and Index System of Physchological Warfare Effectiveness" ["心理战效能评估及指标体系建构"], *National Defense Technology* [国防科技], Vol. 44, No. 6, December 2023. For analysis, see Beauchamp-Mustafaga, 2023a.

auxiliary information decisionmaking," provide a "comprehensive information display," and enable "operational command and control."

7. *Database management* [数据库管理]. This would serve as the foundation of Li's envisioned system and include a database and knowledge base.

Turning to the requirements to leverage AI, Li's 2019 vision relied on multiagent systems, which he defined as "large, distributed systems comprised of several independent, loosely coupled agents," with the ability to "simulate logical human social behavior and achieve information sharing between agents, thereby allowing agents to cooperate to complete tasks."[196] Adapted to his area of focus, online public opinion, Li envisioned these as "capable of post generation, adaptive selection of guidance timing and methods, and other self-learning activities" and as "coordinate guidance of online public opinion, i.e., self-organization."[197] They would be able to operate on multiple online media, including "forums, microblogs, and other social media websites."[198] Li in his 2020 article also listed the general types of capabilities and technologies required to make this work, including "intelligent post generation" [网评帖文智能生成], "account cultivation" [账号培育], and "information delivery" [信息投放].[199]

Li foresees this as a multidisciplinary effort drawing on all the tools at the PLA and CCP's disposal. Li's research cites a very broad range of academic disciplines he seeks to integrate: computer science and technology, information and communication engineering, military science, cybersecurity, philosophy, legal studies, political science, sociology, psychology, and management science.[200] He goes on to include social computing technology, online public opinion surveillance and guidance technology, online information blocking technology, information synthesis technology, online information sending technology, online public opinion struggle effectiveness evaluation technology, database and knowledge base technology, and cybersecurity technology. Li even refers to holograms and virtual reality as other supporting technologies, which are popular pet topics for PLA IO researchers.[201] Li also suggests that China "must strengthen technology research through the whole of academia, media fusion, and

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[196] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[197] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[198] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[199] The full list includes intelligent online public opinion guidance capabilities, including online public opinion situation perception capabilities, online public opinion guidance simulation deduction capabilities, intelligent post generation capabilities, and account cultivation and information delivery capabilities; online public opinion guidance environment simulation technology, including public opinion incident knowledge atlas construction, supernetwork module structuring and training, supernetwork metrics, public opinion leader identification, public opinion dissemination route analysis, and public opinion content evolution analysis; online public opinion guidance intelligent agent technology, including online public opinion guidance results evaluation, post generation, guidance methods modelling analysis, and multiagent coordinated guidance. See Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[200] Li Bicheng [李弼程], 2016.

[201] Beauchamp-Mustafaga, 2023a.

innovation coordination."[202] Other PLA researchers have similarly called for a multidisciplinary approach; one 2022 article calling for PLA adoption of social bots argued that they require "building a computer propaganda team"

> by carefully selecting professionals in computer science, communication, big data, and quantitative analysis by improving the computing communication expert database and cloud think-tank platform and relying on colleges and universities to set up comprehensive laboratories for social bots.[203]

Additional Details on Text Generation

A master's thesis by a Huaqiao University student that Li supervised likely provides more insights into how Li is approaching the issue of text content creation at a technical level.[204] Li served as advisor for Hu Shengwei, who coauthored an article with Li and directly cited Li's 2019 NSSF grant on "Research on Online Public Opinion Intelligent Guidance Simulation Deduction and System Modeling" as supporting Hu's thesis research.[205] Hu explains that the thesis is focused on developing "automatic generation technology" [自动生成技术] for "public opinion–guiding posts" [舆论引导帖文] using deep learning because the traditional approach has low intelligentization and poor guidance effects (the exact same criticism Li frequently makes). Hu specifically points to three shortcomings (as of 2020): First, "[t]he generation of post content is mechanical, the mode is fixed and single, and there is no diversity, so it cannot be generated in large quantities."[206] Second, "the writing style of netizens is not considered, and the generated posts do not have the personalized style and anthropomorphic characteristics of

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[202] Li Bicheng [李弼程], 2016.

[203] Long Yameng [龙亚蒙] and Zhou Yang [周洋], "Research on the Application of Social Bots in Public Opinion Struggle" ["社交机器人在舆论斗争中的应用研究"], *Military Correspondent* [军事记者], March 2022.

[204] Hu Shengwei [胡盛伟], "Research on Conditional Text Generation Technology and Its Application based on Deep Learning" ["基于深度学习的条件文本生成技术与应用研究"], master's thesis, Huaqiao University [华侨大学], April 2020.

For PLA research of note, see Yang Sen [杨森], "Research on Cross-Modal Natural Language Generation" ["跨模态自然语言生成关键技术研究"], master's thesis, National University of Defense Technology [国防科技大学], 2021; Lin Fuqiang [林福强], "Research on Key Technologies of Text Generation in Social Media" ["社交文本智能生成关键技术研究"], master's thesis, National University of Defense Technology [国防科技大学], 2022; Zhang Weikang [张伟康], "Research on Multi-Turn Dialogue Generation Method Based on Improved Context Modeling" ["基于改进上下文建模的多轮对话生成方法研究"], master's thesis, National University of Defense Technology [国防科技大学], 2022; Zhang Xingxin [张兴信], Guo Zhigang [郭志刚], and Chen Gang [陈刚], "Review on Controlled Text Generation Technology" ["受控文本生成技术研究综述"], *Journal of Information Engineering University* [信息工程大学学报], 2022.

[205] Hu Shengwei [胡盛伟], Li Bicheng [李弼程], Lin Kongjie [林孔杰], and Xiong Yao [熊尧], "MaskAE: Unsupervised Short Text Sentiment Transfer Method" ["MaskAE: 基于无监督的短文本情感迁移方法"], *Journal of Chinese Information Processing* [中文信息学报], Vol. 34, No. 2, February 2020.

[206] Hu Shengwei [胡盛伟], 2020.

netizens."[207] Third, "[i]t is impossible to freely customize the theme and emotion of the post. Once there is a new text generation requirement, it is necessary to recustomize the rules and templates, which is time-consuming and laborious."[208] These criticisms align closely with Li's criticisms in his own research, further suggesting close collaboration between the two.

Hu's objective is specifically to develop

> conditional text generation [条件文本生成] based on deep learning, including conditional text generation with controllable emotion [可定制文本属性的条件生成]; conditional text generation with controllable emotion and topic [情感与主题可控的条件文本生成]; and online review post generation with topic, emotion, and style [以及融入主题, 情感和文风的网评帖文生成].[209]

Hu traces the rise of deep learning, generative adversarial networks [生成式对抗网络] (GANs) and variational auto-encoders [变分自编码器] that

> brought a technological revolution to the generation of natural language text, breaking the previous stereotypes based on templates and rules. In the following years, a large number of text generation algorithms were proposed, including random text generation with diversity generation as the goal, as well as conditional text generation with customized emotions.[210]

Hu adds,

> These deep learning–based text generation methods offer the possibility to generate large amounts of fluent, informative, and customizable natural language texts. Therefore, research on how to use deep learning technology to generate online comment posts, especially the conditional generation of customizable text attributes, can greatly improve the efficiency and quality of online comment post generation and has high research value.[211]

Looking forward, Hu provides some insights on where content creation efforts might go next (after 2020). First, Hu seeks to lower the requirement for training data, making content generation faster and cheaper—previewing the advances of generative AI and LLMs. Hu writes that, "at the current stage, the generation method of online comment posts [网评帖文生成方法] based on deep learning is highly dependent on training data, and each public opinion event needs to build a large number of exclusive corpora [大量专属语料库]."[212] Moreover, "building a high-

[207] Hu Shengwei [胡盛伟], 2020.

[208] Hu Shengwei [胡盛伟], 2020.

[209] Hu Shengwei [胡盛伟], 2020.

[210] Hu Shengwei [胡盛伟], 2020.

[211] Hu Shengwei [胡盛伟], 2020.

[212] Hu Shengwei [胡盛伟], 2020.

quality exclusive corpus often requires a lot of manpower, material resources, financial resources and time."[213] Instead, Hu wants to

> make full use of the existing network corpus resources [网络语料资源], pretrain the general online review post generation model [通用网评帖文生成模型], and use the transfer learning [迁移学习] method to realize online review post generation that integrates the theme [主题], emotion [情感], and style [文风] by building only a small exclusive corpus [小型专属语料库].[214]

This also reflects a greater desire to operationalize this capability, not just satisfy a slower academic pursuit.

Second, Hu seeks to be able to generate longer content. Hu complains that the current "method of online comment posts based on deep learning is mainly applied at the sentence level, and the amount of information contained in the posts is limited."[215] Instead, he hopes to "study paragraph and chapter-level long post generation methods to increase the information content of posts, make posts more persuasive, and enhance the effectiveness of public opinion guidance."[216]

Third, Hu also hopes to make the generated content more personalized. Hu notes that "the deep learning-based generation method of online commentary posts only considers the overall writing style of netizens and does not consider personal customization."[217] Instead, he hopes in the future to "study the generation technology of customized posts for internet opinion leaders in combination with the user portraits [用户画像] of internet Big Vs, so as to make the posts more targeted."[218]

Fourth, Hu seeks better content delivery. Hu notes that while his research focuses only on content generation, "the timing [投放时机] and target [投放对象] of public opinion guidance posts should also be considered, which is crucial to the effect of online public opinion guidance."[219] So he hopes there would be additional research on "theories such as the analysis of the spread and diffusion of online public opinion [网络舆论传播扩散], promote the deep integration of social science and natural science," to "propose a complete set of theoretical systems and application methods for intelligent guidance of online public opinion."[220]

One thing Hu does not specifically comment on is the ability to conduct better natural language processing (NLP), specifically word segmentation, for Chinese-language text. In the

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[213] Hu Shengwei [胡盛伟], 2020.

[214] Hu Shengwei [胡盛伟], 2020.

[215] Hu Shengwei [胡盛伟], 2020.

[216] Hu Shengwei [胡盛伟], 2020.

[217] Hu Shengwei [胡盛伟], 2020.

[218] Hu Shengwei [胡盛伟], 2020.

[219] Hu Shengwei [胡盛伟], 2020.

[220] Hu Shengwei [胡盛伟], 2020.

process of his research, Hu identified that the segmentation tool he was using did better with English-language text than Chinese-language text, which resulted in some incorrect Chinese-language outputs. Hu wrote, "generally speaking, under the same conditions, since the text generation technology of Chinese corpus incorporates some noise in the word segmentation process, data modeling is more difficult than that of English corpus, thus affecting the generation effect."[221] It is unclear why Hu would overlook the issue of word segmentation for Chinese text, but it is possible that he is more interested in producing English-language content (foreign influence operations).

Some Details on Tailoring Content to Specific Users

More recent work that Li Bicheng has coauthored with some of his other students focuses on better tailoring the generated text to specific users. A 2024 article proposed training a model for the purpose of "personalized recommendation [个性化推荐], and positive guidance of information dissemination [信息传播正向引导]."[222] The model would identify, label, and categorize a user's posts, then adaptively merge these categories to arrive at an accurate understanding of the user's interests. The model would then count the number of posts by each overall category and determine the user's top interests. This line of research appears to have been of interest to Li since at least 2021, when he supervised a master's thesis researching how to identify users' attributes and interests and then make better "personalized information recommendations."[223]

Testing

Li's 2020 coauthored article seeks to improve China's performance by developing a simulated environment to test this new AI-driven capability, which appears to include multiple

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[221] Hu Shengwei [胡盛伟], 2020.

[222] Kang Zhiyong [康智勇], Li Bicheng [李弼程], and Lin Huang [林煌], "User Interest Recognition Method Incorporating Category Labels and Topic Information" ["融入类别标签和主题信息的用户兴趣识别方法"], *Computer Science* [计算机科学], 2024.

[223] Yu Youqin [郁友琴], "Research on Microblog User Interest Recognition and Text Information Recommendation Technology" ["微博用户兴趣识别与文本信息推荐技术研究"], master's thesis, Huaqiao University [华侨大学], 2021. Li also coauthored an article building on this with the student. See Yu Youqin [郁友琴] and Li Bicheng [李弼程], "Microblog User Interest Recognition Based on Multigranularity Text Feature Representation" ["基于多粒度文本特征表示的微博用户兴趣识别"], *Computer Science* [计算机科学], December 2021.

Other PLA researchers are also working on this. See, for example, Feng Haonan [冯皓楠], He Zhiyong [何智勇], and Ma Liangli [马良荔], "Multimodal Label Recommendation Based on Text-Enhanced Coattention Mechanism" ["基于文本增强的共注意机制的多模态标签推荐"], *Journal of Shaanxi Normal University(Natural Science Edition)* [陕西师范大学学报(自然科学版)], 2023.

models or at least different options for guidance strategies [引导策略].[224] Li and his coauthors refer to this as an "intelligent guidance simulation deduction model" [智能引导仿真推演模型] that can support his desire for a revised process: "situational awareness–simulation deduction–opinion guidance."[225] Li's goal is to "add online public opinion guidance simulation deduction and strategy evaluation function modules" to his existing system.[226] Other researchers in China are also considering simulated online public opinion, but Li criticizes their shortcoming of analyzing only past incidents.[227] Instead, Li wants to be able to predict the impact of future potential campaigns and, thus, select the optimal approach.

In this 2020 article, Li is still trying to improve on sock puppet posting and understands that AI must be trained and optimized based on data that are as realistic as possible. Li wants his system to be able to "evaluate guidance timing, post content, modes and methods, and guidance results according to changes in online public opinion, thereby self-adaptively selecting an appropriate guidance strategy."[228] However, "trying these strategies directly in a real online environment is not realistic," so Li is seeking to "solve the issue of not being able to test guidance strategies in a real online environment."[229]

Li's vision for incorporating the simulated environment is quite simple, if complicated in implementation. The first step is "online public opinion information retrieval and situational analysis to gain understanding of the public opinion situation."[230] That is, retrieve and analyze available information on real-world online discussions, such as data from a social media platform. Second, based on this understanding, "use the simulation model of intelligent online

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[224] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020. For other work by Li and some of his students on incorporating offline dynamics into public opinion modeling, see Zeng Rongshen [曾荣燊], Li Bicheng [李弼程], Chen Gang [陈刚], and Xiong Yao [熊尧], "An Analysis of Public Opinion Evolution Based on Online-Offline Supernetwork Model" ["基于线上-线下超网络模型的舆论演化仿真分析"], *Application Research of Computers* [计算机应用研究], October 2023.

[225] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[226] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[227] See, for example, Ma Ning [马宁], Liu Yijun [刘怡君], "Multiagent Modeling of Public Opinion Evolution Based on Hypernetwork" ["基于超网络的舆情演化多主体建模"], *Journal of Systems and Management* [系统管理学报], Vol. 24, No. 6, November 2015; Ha Da [哈达], Tan Zhiguo [谭志国], and Wang Hao [王浩], "Research on Agent-based Public Opinion Evolution Under Complex Networks" ["复杂网络下基于 Agent 的舆情演化研究"], *Firepower Command and Control* [火力与指挥控制], Vol. 42, No. 8, August 2017; Xia Ziran [夏子然], "Analysis and Simulation of Group Behavior in the Evolution of Online Public Opinion Based on BDI Model" ["基于 BDI 模型的网络舆情演变过程中群体行为分析与仿真"], master's thesis, Nanjing University of Science & Technology [南京理工大学], 2015; Gao Qingning [高庆宁], "Analysis and Simulation of Group Behavior in the Evolution of Online Public Opinion Based on SOAR Model" ["基于 SOAR 模型的网络舆情演变过程中群体行为分析与仿真"], master's thesis, Nanjing University of Science & Technology [南京理工大学], 2016.

[228] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[229] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[230] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

public opinion guidance to conduct simulated deduction on various types of guidance strategies and self-adapt to select the appropriate strategy."[231] That is, based on the analysis of the real-world data, use the model to evaluate and then optimize various potential content and distribution strategies to artificially influence the desired online discussions, likely as a larger campaign. Third, "apply the guidance strategy in a real online environment, namely generate posts, distribute information, and conduct public opinion guidance according to the guidance strategy."[232] That is, develop and execute this chosen campaign in the real world.

The simulated environment leverages existing real-world data, cognitive science, and network modeling. The *supernetwork model* [超网络模型] is made up of a social subnet [社交子网], psychological subnet [心理子网], environmental subnet [环境子网], and opinion subnet [观点子网], with "nodes within and between each level connecting to each other."[233] The social subnet represents netizens (internet users), the psychological subnet represents the netizens' "psychological features," and the opinion subnet nodes are the "tonal tendencies of online information (positive, neutral, negative)."[234] The "entire model represents the opinions expressed by netizens under the influence of psychological factors and online information."[235] The simulation can be adjusted to include various numbers of positive (likely pro-China), neutral, and negative (likely anti-China) netizens and various amounts of opinion leaders [舆论领袖 or 意见领袖] with positive speech [正面发言] and can vary their participation over time. The model can also simulate various numbers of positive posts [正面帖文] or deletion of negative posts (likely critical of China) at different times. Ultimately, "by changing the parameters and conducting a comparative analysis of the simulation results, we can determine the optimum guidance strategy."[236] The fact that Li is referencing censorship (deleting negative posts) suggests that this research could also be applied to China's domestic information space.

In designing this simulated environment, Li considered various software platforms, including Netlogo, Anylogic, Netic, Vemsim, Swarm, and Matlab; in the end, he recommends Netlogo. This is because of Netlogo's "friendly graphical interface and output window," which "can intuitively display the entire public opinion evolution process, from formation to spread to eruption to evolution to extinction."[237] However, Netlogo's downsides include "not being able to provide the model's debugging with single step tracking in a traditional integration developed environment," and especially "when dealing with a large number of actors in a multiagent

[231] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[232] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[233] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[234] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[235] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[236] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[237] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

modelling simulation, it is difficult to conduct individual debugging on each independently operating individual."[238]

Li's effort to develop an ability for the PLA to test its public opinion guidance capabilities is mirrored in another recent PLA article, suggesting broader PLA interest in the topic. Published in *China Military Science*, the PLA's premier journal, and written by two political work researchers at the PLA's AMS, the article discusses how to develop, simulate, and test CDO tactics.[239] However, this 2022 article does not cite Li's 2020 paper.

Conclusion

This overview of Li's core research demonstrates his forward-looking ambitions for what AI could do for Chinese Party-state social media manipulation efforts. While it is difficult to assess the full extent of adoption, Li's work is cited by other Chinese researchers, including PLA researchers at Base 311.[240] The next chapter provides a technical assessment of his research and considers the implications of generative AI.

[238] Li Bicheng [李弼程], Xiong Yao [熊尧], et al., 2020.

[239] Zheng Zhongliu [郑重刘] and Ying Yuanli [颖袁莉], "Supporting Theoretical Innovation in Cognitive Warfare with Cognitive Operations Experimentation" ["用认知域作战实验支撑认知域作战理论创新"], *China Military Science* [中国军事科学], November 2022.

[240] See for example Guo Xiaodong [郭晓东], "End-to-End Chinese Crowd-Turfing Attack and Defense Method" ["端到端的中文评论众包攻击与防御方法"], master's thesis, Wuhan University, 2020; Zhang You [张优], "Research and Application of End-to-end Chinese Text Generation" ["端到端的汉语文本生成研究与应用"], master's thesis, Qinghai Normal University, 2022. For PLA Base 311 citation, see Wang Haitao [王海涛] and Han Donghui [韩冬晖], "Exploration of the Application of Blockchain Technology in the Era of Integrated Media" ["区块链技术在融媒体时代的应用探索"], *Radio and Television Information* [广播电视信息], June 2020.

Chapter 5. Technical Evaluation of Li Bicheng's Research and Potential Implications of Generative Artificial Intelligence

Li's research, especially his 2019 article (coauthored with the PLA's only known IO unit), represented cutting-edge expertise (at the time) on the future of AI, and we argue that Li is well-positioned to leverage generative AI for his intended purposes of online influence operations, including social media manipulation. This chapter provides a technical evaluation of Li's research and considers the implications of generative AI for his stated ambitions.

We argue that current LLM technology is sufficient to conduct Li's proposed automated public opinion guidance system; China likely has the capacity to operationalize the system. This is not to say the entire Party-state will adopt this technology overnight or employ it to its full extent. There are challenges moving from capabilities to a robust capacity to conduct automated social media manipulation. For example, engineering existing technologies into a working system is a nontrivial challenge, and a plausible system will also require language and context-specific data for fine-tuning generated content. Overall, however, if China chooses to pursue this operating concept for automating influence, we argue it is a fairly straightforward engineering process to turn capabilities into capacity: Collect training data; train models; deploy models, resources, and tools in a sandbox environment; test iteratively; and deploy. Available open-source evidence suggests that at least parts of the Party-state began using generative AI in 2023, and we assess that it would be very possible, assuming Beijing allocates appropriate resources, for China to have the ability to target the upcoming November 2024 elections in the United States.

Technical Evaluation of Li's Research

Given the breadth of Li's research, we focus our technical evaluation here on his work on content generation. This section provides additional technical details of Li's research effort and then a comparison with Western state-of-the art research. Overall, we find that Li has done consistently good work in NLP and clearly keeps up with major trends in global research, although at least some of his underlying technical work is less innovative than he claims. Taking the totality of his work, we suggest his research keeps pace with global advances over time but lags perhaps 12–18 months behind true Western state-of-the-art research.

Affective Text Generation

Li coauthored a January 2023 journal article on affective text generation [情感文本生成], and we argue it is a good marker for his technical creativity and expertise in NLP, just prior to

the generative AI revolution.[241] The article shows Li grappling with a hard problem within NLP/automated influence, using state-of-the-art approaches for that time.

Li's research focuses specifically on affective text generation under hard constraints [硬约束限制], that is, incorporating specific words, with the goal of making generated text more authentic. The specific challenge is that artificially guiding (controlling) public opinion online means interacting with real humans, raising the bar for the quality of the content created, and the diversity coupled with brevity of social media makes this very difficult. Specifically, "commenting needs to be relevant to the main content and must include specific sentiment tendencies, while also maintaining smoothness and alignment with real human speech."[242] In other words, *generating* natural sounding language is harder than *understanding* natural language. In the latter, the goal is usually to either understand top level meaning or extract specifics at the micro level. Whereas in generating effective, human sounding text, micro-level structures, meso-level, and macro-level meaning all have to synchronize and connect. For example, a notional generated review for a restaurant—"I'd had a really bad birthday so far, but at dinner we had great service and delicious food—2 out of 5 stars at best"—makes sense at the micro level of each phrase but does not match the overall message. "There was a screwup in our order, but the staff's solicitous response and the amazing dessert they comped us with more than made up for it. Will def go there again," on the other hand, works across the whole of the message.

Li's solution, in line with other global research around that time, is that deep learning—specifically "pretrained model-based controllable text generation methods"—can be used to train models to ensure that the generated content's aspect and sentiment are consistent with the human-produced online comment they are intended to be engaging with. The main benefit is that, "from a social psychology perspective, text that includes aspect and sentiment holds a high level of authenticity, which allows it to generate approval while penetrating deep into online communities."[243] This is a broadly studied problem (aspect-based sentiment analysis) among other researchers, and the use of early generative transformer models (e.g., Bidirectional Encoder Representations from Transformers [BERT]) was common at the time Li was likely conducting this research (2022).[244] Li proposes to solve the problem by specifically training a BERT model to recognize specific words and relationships at the micro level (hard constraints). So, while what

[241] Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], 2023.

[242] Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], 2023.

[243] Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], 2023.

[244] For example, see Ehsan Hosseini-Asl, Wenhao Liu, and Caiming Xiong, "A Generative Language Model for Few-shot Aspect-Based Sentiment Analysis," paper, April 11, 2022. For earlier work by Chinese researchers from Fudan University, see Chi Sun, Luyao Huang, and Xipeng Qiu, "Utilizing BERT for Aspect-Based Sentiment Analysis via Constructing Auxiliary Sentence," paper, March 22, 2019.

Li proposes is not particularly innovative, it demonstrates technical feasibility and field awareness. Li has consistently done good work in NLP.

Li's approach is to "correctly set word weight [to] make a model pay attention to aspect words and sentiment words, thereby allowing it to produce controllable and logical high-quality text . . . [and] to accurately follow and maintain original aspect and sentiment."[245] Li frames his research as a continuation of both foreign and Chinese domestic research:

> On the foundation of pretrained language models, our model fully considers the characteristics of texts containing aspect and sentiment, conducts importance evaluations on every word, and creates more-reasonable pretraining data. Using this method, our model is able to generate the important parts of affective text first, which allowed it to obtain a higher BLEU score [; . . .] our model obtained the highest score for all three indices.[246]

This, he notes, was based on a machine and human comparison of "grammatical and semantic accuracy, content invariability, and sentiment accuracy." Ultimately, "our model not only maintained the original description subject but also had sentiment polarity consistent with the original sentence."[247]

Li argues that his approach is innovative and promising, although he acknowledges that there is room for improvement. He writes that "experimental results based off of open-source data sets from two different fields show that the text generated by our method is a significant improvement compared to baseline models in terms of quality, diversity, and accuracy of sentiment."[248] Turning to its shortcomings, he notes that "the subject and sentiment words extracted by this method rely on the quality of aspect sentiment triplet extraction."[249]

Fine Tuning LLMs

Entering into the generative AI era, Li cofiled a patent in December 2023 that focused on how to fine tune a general LLM, specifically in this case for medical text.[250] Li and his colleagues explain that the invention focuses on an "automatic generation method of a large model fine tuning instruction" [大模型微调指令], through several steps: (1) build the corpus, (2)

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[245] Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], 2023.

[246] A BLEU score is a metric for evaluating the quality of machine-translated text. See Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], 2023.

[247] Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], 2023.

[248] Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], 2023.

[249] Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], 2023.

[250] Wang Huazhen [王华珍], Hu Xuanlang [胡渲郎], Lin Zhizhong [林致中], You Haibin [尤海滨], He Ting [何霆], and Li Bicheng [李弼程], "Automatic Generation Method, Device, Equipment and Medium for Large Model Fine Tuning Instruction" ["一种大模型微调指令自动化生成方法, 装置, 设备及介质"], Chinese patent number CN117573835A, February 20, 2024.

use prompt fine tuning, (3) compare results based on vector representations (embeddings), then (4) refine and adjust as necessary.[251]

The patent filing presents a detailed overview of an automated method for generating fine-tuning instructions for large models, specifically in this case for medical purposes.[252] *Fine-tuning* is the process of taking an existing LLM and modifying it for specific tasks, a specific domain, or both. Fine-tuned (or instruction-trained) models are in contrast with base models, which have been pretrained on language in general. Base models have learned the general patterns of language but not such tasks as answering questions, engaging in dialogue, or writing code. But by fine-tuning on an additional dataset (which is orders of magnitude less computationally expensive than the initial training), the model learns to accomplish tasks and, potentially, learn the linguistic nuances of a domain.

So, for example, if we wished to create an LLM that understands U.S. Army doctrine, we could take a base model and fine-tune it on a dataset of questions and answers derived from U.S. Army doctrinal publications. A base model will respond to prompts but in a fairly incoherent way, until it has been fine-tuned to follow instructions, e.g., answering questions. The challenge is in the human labor required for creating a high quality, diverse set of instruction training data, a challenge Li's patent seeks to address.

Li Bicheng and his colleagues propose using a pretrained Chinese-language model to understand and process medical dialogue texts. From there, the proposed method uses vector representation to convert text into mathematical vectors in meaning space, allowing the measurement of similarity between different pieces of text. Then, a maximum margin relevance algorithm helps sample the most relevant machine-generated instructions from this pool, focusing on quality and relevance. Finally, similar instructions are grouped together via K-means clustering (automatic partitioning), as a way to refine the instruction pool by identifying and enhancing diverse and high-quality dialogue scenarios. This process would iteratively update the instruction pool to generate more-diverse and high-quality dialogue data.

This is a potentially useful way of generating fine-tuning data for a very specific purpose and domain (medical provider and patient interactions). It is not clear how well this proposed system would work, but, on the face, it seems plausible. And while this particular patent application is for medical use, the method is transferrable to many domains and purposes, including military and strategic ones.

Implications of Generative AI for Li's Research

Because Li had not published much research since the release of ChatGPT as of when this report was drafted in late 2023, we have limited direct evidence for what he thinks about the new

[251] Wang Huazhen [王华珍] et al., 2024.

[252] Wang Huazhen [王华珍] et al., 2024.

capability. However, drawing on his existing writings and recent RAND research, we outline in this section how Li may leverage generative AI and argue that he is well-positioned to adopt it quickly. Given Li's specific plan for operationalizing a fully automated public opinion guidance system and his further research laying out influence operations as a warfighting function, we argue that China and PLA have a plausible path to building a robust online influence capacity. They may, perhaps, be behind the United States in technology and information doctrine but are following in U.S. footprints.

This vision would do much to address Li's original criticism of China's existing capabilities (circa 2019) and would be supercharged with generative AI. In his 2019 article, Li's vision boils down to five main capabilities.[253] As a recent RAND report summarized, these are the ability to

> 1. Receive public opinion situation and guidance orders from command-and-control centers
> 2. Select appropriate post generation models according to the topic, style, and emotional tone set by guidance orders, and generate posts with certain character traits
> 3. Adjust guidance timing and methods based on current online public opinion
> 4. Publish posts and conduct public opinion guidance based on set behavioral characteristics and guidance timing and methods
> 5. Carry out coordinated online public opinion guidance between multiple intelligent agents.[254]

As that report concluded,

> [i]n the above five capabilities, generative AI will help with content generation (capability 2), and the potential for autonomous action from LLMs and their interactivity may mean they can assist with solving the orchestration (capability 3), delivery (capability 4), and coordination (capability 5) challenges.[255]

We analyze these in more detail in the following subsections.

Content Generation Improved by LLM and Other Models

Li's research on text generation, as discussed earlier, would be well-positioned to harness LLMs; they are a technological continuation of what he was already working on. Moreover, Li would likely be interested in the rise of text-to-image, text-to-speech, and text-to-video models as well. In his 2016 article, Li did address creating multiple types of media and even multimedia content creation, but the majority of his work focuses on text generation.[256] For example, when

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[253] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[254] Marcellino et al., 2023.

[255] Marcellino et al., 2023.

[256] Li Bicheng [李弼程], 2016.

discussing “online public opinion information production” [网络舆论信息制作], Li proposed “utilizing speech synthesis technology, imaging/video stitching technology, and multimedia camouflage technology [多媒体伪装技术] to generate the target’s voice, specific background, specific setting, etc., form multimedia information with images, text, and sound.”[257] Other PLA researchers are interested in synthetic or fake audio [语音合成], among other ideas, and this merits further research.[258]

Generative AI would likely support Li’s vision by improving content generation with a robust ability to generate wide-ranging content. Moreover, the ability to easily fine-tune models for specific target audiences and to switch between multiple models, makes LLMs a marked improvement over BERT models. Li and Hu have criticized deep learning and BERT models for their lack of personalization, limited content generation, and limited automation potential, and LLMs with minimal fine tuning can offer a rapid improvement. Moreover, previewing the benefits of LLMs for coordination, they could also select whether to produce text, audio, or video, depending on the specific desired effects. Additionally, the development of multimodal models means that Li’s system could respond dynamically to multiple types of input online.

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[257] Li Bicheng [李弼程], 2016.

[258] For older PLA interest, see Chen Danwen [陈丹雯], “Research on Text-Driven Virtual News Generation Technology” [“基于文本驱动的虚拟新闻生成技术研究”], master’s thesis, National University of Defense Technology [国防科学技术大学], 2006; Bu Jiang [卜江] et al., 2011; Guo Xiaoyi [郭小一], Lao Songyang [老松杨], and Zhang Guohua [张国华], “Information Producing of Psychological Suggestion Based on Video Superimposing” [“基于视频叠加的心理暗示”], *Systems Engineering—Theory and Practice* [系统工程理论与实践], Vol. 32, No. 2, February 2012.

For recent general PLA research, see Tao Jianhua [陶建华], Fu Ruibo [傅睿博], Yi Jiangyan [易江燕], “Development and Challenge of Speech Forgery and Detection” [“语音伪造与鉴伪的发展与挑战”], *Journal of Cyber Security* [信息安全学报] Vol. 5, No. 2, March 2020; Zhang Xiaofeng [张小峰], Xie Jun [谢钧], and Luo Jianxin [罗健欣], “Research on Deep Learning Speech Synthesis Technology” [“深度学习语音合成技术研究”], *Computer Era* [计算机时代], September 2020; Zhang Xiaofeng [张小峰], Xie Jun [谢钧], Luo Jianxin [罗健欣], “Overview of Deep Learning Speech Synthesis Technology “ [“深度学习语音合成技术综述”], *Computer Engineering and Applications* [计算机工程与应用], Vol. 57, No. 9, March 2021; Liang Xiaobo [梁晓波], “On the Structure and Configuration of Defense Language Capability” [“论国防语言能力的构成与配置”], *Journal of Yunmeng* [云梦学刊], Vol. 42, No. 3, April 2021b; Yu Yuanlai [余远来] and Chen Qian [陈茜], “Effective Mechanism and Strategy Choice of Cognitive Domain Operations” [“认知域作战的致效机理与策略选择”], *Front of Thought and Theory* [思想理论战线], July 2022.

For recent research from PLASSF IEU, see Qiu Zeyu [邱泽宇], Qu Dan [屈丹], and Zhang Lianhai [张连海], “End-to-End Speech Synthesis Based on WaveNet” [“基于 WaveNet 的端到端语音合成方法”], *Journal of Computer Applications* [计算机应用], Vol. 39, No. 5, January 2019; Yang Shuai [杨帅], Qiao Kai [乔凯], and Chen Jian [陈健], “Overview on Speech Synthesis, Forgery and Detection Technology” [“语音合成及伪造, 鉴伪技术综述”], *Computer Systems and Applications* [计算机系统应用], Vol. 31, No. 7, July 2022; Tang Jun [唐君], Zhang Lianhai [张连海], Li Jiaxin [李嘉欣], “A Real-time Robust Speech Synthesis Method Based on Improved Attention Mechanism” [“一种基于改进注意力机制的实时鲁棒语音合成方法”], *Journal of Signal Processing* [信号处理], Vol. 38, No. 3, August 2022.

Content Delivery and Coordination Improved by LLM Verbal Reasoning and Building Ecologies of Models, Tools, and Resources

Li described a multiagent system able to cooperate to complete tasks to conduct public opinion monitoring and guidance. Without specifically describing LLMs, Li foresaw an eventual level of AI problem-solving ability and content generation that could enable such a multiagent system. Li was prescient: current generation LLMs exhibit a number of emergent properties that plausibly enable his proposed architecture. These include verbal reasoning skills; the use of ecologies of models, tools, and resources; and agentic qualities to take action independently.[259]

LLM's have demonstrated an emergent capability to reason and solve problems.[260] The ability of LLMs to reason depends on the model and training and, in particular, the prompt strategies used in giving instructions to LLMs. Generally, larger models trained on more data perform better in reasoning tasks. However, easily accessible open-source models that are lightweight and cheap come very close in performance in reasoning benchmarks, compared with bigger and more expensive models, such as OpenAI's GPT-4.[261] In particular, these models can be prompted into chains of thought, decomposing very complex, multistep problems into a chain of steps that the LLM can then solve. Furthermore, LLMs can be engineered to consider multiple options and assess them, a sort of ensemble method of reasoning through problems known as *tree of thought* approaches.[262]

In addition to reasoning and problem-solving skills, LLMs can become even more powerful in achieving goals through cooperative ecologies of models, resources, and tools. Multiple LLMs connected via application programing interface calls can collaborate and share tasks and can even teach other models what they have learned.[263] These modular LLMs can then be connected to other resources (the internet, databases, knowledge graphs) and tools (robots, chemical synthesis benches) to accomplish a wide variety of tasks, not only digital but even reaching into

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[259] Marcellino et al., 2023.

[260] Yao Fu, Litu Ou, Mingyu Chen, Yuhao Wan, Hao Peng, and Tushar Khot, "Chain-of-Thought Hub: A Continuous Effort to Measure Large Language Models' Reasoning Performance," paper, 2023; Hongru Wang, Rui Wang, Fei Mi, ZezhongWang, RuifengXu, and Kam-FaiWong, "Chain-of-thought prompting for responding to in-depth dialogue questions with LLM," paper, May 19, 2023; Jason Wei, Xuezhi Wang, Dale Schuurmans, Maarten Bosma, Brian Ichter, Fei Xia, Ed Chi, Quoc Le, and Denny Zhou, "Chain-of-Thought Prompting Elicits Reasoning in Large Language Models," paper, January 10, 2023.

[261] See Yusuf Cay, "GPT-4 Test Scores: Performance Against Humans," *ChatGPT Blog*, July 25, 2023; "Open LLM Leaderboard," webpage, Hugging Face, undated.

[262] Shunyu Yao, Dian Yu, Jeffrey Zhao, Izhak Shafran, Thomas L. Griffiths, Yuan Cao, and Karthik Narasimhan, "Tree of Thoughts: Deliberate Problem Solving with Large Language Models," paper, December 3, 2023.

[263] Swarnadeep Saha, Peter Hase, and Mohit Bansal, "Can Language Models Teach Weaker Agents? Teacher Explanations Improve Students via Theory of Mind," paper, November 14, 2023; Hongxin Zhang, Weihua Du, Jiaming Shan, Qinhong Zhou, Yilun Du, Joshua B. Tenenbaum, Tianmin Shu, and Chuang Gan, "Building Cooperative Embodied Agents Modularly with Large Language Models," paper, February 17, 2024; Yashar Talebirad and Amirhossein Nadiri, "Multi-Agent Collaboration: Harnessing the Power of Intelligent LLM Agents," paper, June 5, 2023.

the physical world.[264] The ability of LLMs to combine reasoning with external sources is extremely powerful, for example, giving LLMs the ability to use visual reasoning on image data via access to external programming environments—an LLM that can "see" parts of the world and reason about the entities represented visually.[265]

We argue that generative AI would support Li's vision by coordinating model output, optimizing the time and place of posting online, and coordinating further behavior between fake accounts.

Realizing End-to-End Automated Model Through Agentic Qualities of LLMs

In addition to the ability to reason and to collaborate and connect, LLMs have demonstrated a limited form of agency: to make intelligent decisions to accomplish ends, by making inferences beyond the data they were trained on.[266] This ability appeared to be directly related to the linguistic nature of LLMs, which can engage in self-reflection—literally asking "what went wrong on this last attempt to do [task]? What should I do differently on the next attempt?" Thus, they can learn to accomplish tasks through experience.[267] Early experiments with LLMs show that they can indeed interact with outside environments, use their reasoning ability, and figure out how to accomplish goals on their own, including quite nefarious ones, such as researching and synthesizing chemical weapons and illegal drugs.[268]

This would support Li's vision by potentially making the entire end-to-end system automated, limiting human involvement to oversight. Li's system in 2019 was prescient, since model chaining is now an emerging capability that many global researchers are experimenting with.

Li and Broader Chinese Party-State Will Be Able to Leverage Generative AI

Along with Li's intent and research agenda, we specifically argue that these tools will be available to Li, either from China's domestic industry or surreptitiously, using foreign open-

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[264] Yifan Song, Weimin Xiong, Dawei Zhu, Wenhao Wu, Han Qian, Mingbo Song, Hailiang Huang, Cheng Li, Ke Wang, Rong Yao, Ye Tian, and Sujian Li, "RestGPT: Connecting Large Language Models with Real-World Applications via RESTful APIs," paper, August 27, 2023; Andres M. Bran, Sam Cox, Oliver Schilter, Carol Baldassari, Andrew D White, Philippe Schwaller, "Augmenting large-language models with chemistry tools," Arxiv, revised October 2, 2023; Daniil A. Boiko, Robert MacKnight, and Gabe Gomes, "Emergent Autonomous Scientific Research Capabilities of Large Language models," paper, 2023.

[265] Dídac Surís, Sachit Menon, and Carl Vondrick, "ViperGPT: Visual Inference via Python Execution for Reasoning," paper, March 14, 2023.

[266] Jacob Andreas, "Language Models as Agent Models," paper, December 3, 2022.

[267] Noah Shinn, Federico Cassano, Edward Berman, Ashwin Gopinath, Karthik Narasimhan, and Shunyu Yao, "Reflexion: Language Agents with Verbal Reinforcement Learning," paper, October 10, 2023.

[268] Boiko, MacKnight, and Gomes, 2023; Chan Hee Song, Jiaman Wu, Clayton Washington, Brian M. Sadler, Wei-Lun Chao, and Yu Su, "LLM-Planner: Few-Shot Grounded Planning for Embodied Agents with Large Language Models," paper, March 30, 2023.

source tools. Moreover, for Chinese social media manipulation, the bar for success is likely much lower than Western professional benchmark scores. Western open-source models are likely good enough as is because they represent an overall improvement on the abilities of the average Chinese propagandist targeting foreign audiences.[269]

Domestic Resources

The Chinese government has committed to developing a robust AI industry, and Chinese companies are showing promise in developing their own domestic generative AI models, despite some tensions with maintaining Party control.[270] In 2017, China's State Council released its "New Generation AI Development Plan," which set a policy goal of becoming the global leader in AI by 2030 and included a roadmap for success.[271] The Chinese government has invested billions to support this vision, with some success already.[272] Although it was the United States that released the first publicly available generative AI model in OpenAI's ChatGPT, Chinese companies were already also working on this technology and remain not far behind. As of September 2023, China had over 130 LLMs; as of August 2024, the Chinese government had approved more than 180 generative AI models for public release (up from just 40 in January).[273] An April 2024 report by Stanford University researchers found that China produced 15 "notable" AI models in 2023, compared with 61 from the United States and 21 from the European Union.[274] By most accounts, Chinese models' performance lags U.S. models but have continued to improve over time and are within perhaps six months and likely less than a year behind U.S. progress.[275] For example, OpenAI's February 2024 debut of the text-to-video model Sora clearly put the United States lead on cutting-edge models, but this also reinforced Chinese government

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[269] For a review of Chinese performance circa 2019–2020, see Schneider, 2020.

[270] For a recent overview of China's domestic AI sector, see Paul Triolo and Kendra Schaefer, "China's Generative AI Ecosystem in 2024: Rising Investment and Expectations," National Bureau of Asian Research, June 2024.

[271] People's Republic of China State Council, "New Generation AI Development Plan," July 20, 2017. Translation available via Graham Webster, Rogier Creemers, Elsa Kania, and Paul Triolo, "Full Translation: China's 'New Generation Artificial Intelligence Development Plan,'" DigiChina, August 1, 2017.

[272] For a good roundup of Chinese government support, see Ngor Luong and Margarita Konaev, "In & Out of China: Financial Support for AI Development," Center for Security and Emerging Technology, August 10, 2023.

[273] "China Now Has Over 180 LLMs Approved for General Use," TechNode, August 13, 2024; "Chinese Internet Giants Speed Up Development of AI to Tap Vast Market," *Global Times*, April 17, 2024; Josh Ye, "China Approves over 40 AI Models for Public Use in Past Six Months," Reuters, January 28, 2024.

[274] Stanford University, *Artificial Intelligence Index Report 2024*, April 2024.

[275] For one U.S.-China LLM performance comparison, see "Chinese Large Model Benchmark Evaluation 2023 Annual Report" ["中文大模型基准测评 2023 年度报告"], SuperCLUE, December 31, 2023. For a translation of an earlier version, see Jeffrey Ding, "ChinAI #231: Latest SuperCLUE Rankings of Large Language Models," ChinAI, July 31, 2023.

support to avoid falling behind.[276] By June, Chinese tech company Kuaishou released its text-to-video model, Kling, which impressed many observers and reversed perceptions that China was lagging the United States.[277]

Moreover, the Chinese military's efforts to leverage private companies' innovation and capacity under its military-civil fusion strategy mean that the Chinese military is very likely to look keenly at this growing Chinese tech sector as a key stepping stone for China's own efforts.[278] Generative AI is well-suited to Beijing's military-civil fusion strategy because it is a highly dynamic, cutting-edge technology that the Chinese military and broader Chinese state-owned defense industrial base are unlikely to be able to develop and keep pace with on their own, requiring them to look for outside support. Indeed, a January 2024 report suggested that the Chinese military had begun leveraging Chinese commercial LLMs, although the Chinese company involved later disputed the report after its stock crashed because of fear of U.S. sanctions.[279]

Finally, Chinese laws have the potential to not just support cooperation but even to compel Chinese companies to support Beijing's efforts. For example, the 2017 National Intelligence Law, as one U.S. summary put it, "requires individuals, organizations and institutions to assist China's Public Security and State Security offices in their intelligence work."[280] While the details are vague, these concerns arose again recently with U.S. debate over the popularity of TikTok, and it seems possible that the Chinese government could seek to leverage—through carrots or sticks—Chinese companies.

Foreign Resources

Beyond leveraging domestic models, Beijing has two ways it can also use foreign models. First and easiest, it can use publicly available open-source off-the-shelf models, such as Falcon's

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[276] Coco Feng, "Chinese Entrepreneurs Express Awe and Fear of OpenAI's Sora Text-to-Video Generator, as US Sanctions Weigh on AI Race," *South China Morning Post*, February 20, 2024; Coco Feng and Ben Jiang, "OpenAI's Sora Pours 'Cold Water' on China's AI Dreams, as Text-to-video Advancements Prompt More Soul-Searching" *South China Morning Post*, February 24, 2024.

[277] Meaghan Tobin and Cade Metz, "China Is Closing the A.I. Gap with the United States," *New York Times*, July 25, 2024; Paul Mozur, John Liu, and Cade Metz, "China's Rush to Dominate A.I. Comes with a Twist: It Depends on U.S. Technology," *New York Times*, February 21, 2024.

[278] For a good overview, see Alex Stone and Peter Wood, *China's Military-Civil Fusion Strategy*, China Aerospace Studies Institute, June 2020.

[279] Stephen Chen, "China's Military Lab AI Connects to Commercial Large Language Models for the First Time to Learn More About Humans," *South China Morning Post*, January 12, 2024; Sarah Zhang, Jeanny Yu, and Zheping Huang, "Baidu Sinks Most Since 2022 Despite Denying Links to PLA AI," Bloomberg, January 14, 2024.

[280] Sam Sabin, "China's National Security Laws Are Fueling TikTok Fears," Axios, March 15, 2024. See also Murray Scot Tanner, "Beijing's New National Intelligence Law: From Defense to Offense," Lawfare, July 20, 2017.

Falcon AI or Meta's LLaMa.[281] While these are general models, Beijing would be able to fine-tune them for its desired purposes. Second, Chinese Party-state actors could attempt to use foreign publicly available closed-source models covertly or surreptitiously. Indeed, OpenAI reported in May 2024 that Chinese Party-state-affiliated actors, specifically Spamouflage, had used OpenAI's models, specifically Spamouflage, for generating text in multiple languages that was then actually posted online.[282] However, this does not appear to fulfill Li's vision because Spamouflage does not appear to have automated the entire end-to-end system. Third, Beijing's cyber hackers could attempt to steal foreign proprietary models, assuming Beijing would view the gains in performance worth the risks of being caught.[283]

The first option of leveraging publicly available models is likely the most appealing because Beijing would not have to risk detection. Covertly using foreign models, such as ChatGPT, may be the second most appealing because limited use could likely go undetected. However, the benefit of generative AI—especially for influence operations—is in leveraging it for scale, and the risks of detection would increase, perhaps exponentially, with greater use. Nevertheless, Beijing has continued to conduct both cyber theft and covert influence operations despite foreign name-and-shame efforts, suggesting that the risk of detection is not much of a deterrent for the Chinese government. Finally, while Beijing's robust cyber capabilities may well enable it to steal foreign models, the actual benefits of such thefts in practice are debatable. Without the necessary computing power and associated enabling infrastructure, attempting to run a full model is likely a challenge.

Available evidence suggests Beijing is using open-source models and attempting to covertly use other publicly available closed-source models. As one example, PLA researchers have been using Meta's LLaMa model since at least mid-2023, with some PLA researchers adopting new iterations of LLaMa within a month after its release.[284] A March 2024 article coauthored by PLA

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[281] For a good survey of foreign models coauthored by PLA and CAS researchers, see Miao Qinghai [缪青海], Wang Xingxia [王兴霞], Yang Jing [杨静], Zhao Yong [赵勇], Wang Yutong [王雨桐], Chen Yuanyuan [陈圆圆], Tian Yonglin [田永林], Yu Yi [俞怡], Lin Yilun [林懿伦], Yan Ran [鄢然], Ma Jiaqi [马嘉琪],Na Xiaoxiang [那晓翔], and Wang Feiyue [王飞跃], "From Foundation Intelligence to General Intelligence: The State of the Art and Perspectives of GenAI and AGI Based on Foundation Models" ["从基础智能到通用智能: 基于大模型的 GenAI 和 AGI 之现状与展望"], *Acta Automatica Sinica* [自动化学报], Vol 50, No 4, April 2024.

[282] OpenAI, 2024b. For an earlier report, see "Disrupting Malicious Uses of AI by State-Affiliated Threat Actors," OpenAI, February 14, 2024a.

[283] Robert McMillan, Dustin Volz, and Aruna Viswanatha, "China Is Stealing AI Secrets to Turbocharge Spying, U.S. Says," *Wall Street Journal*, December 25, 2023.

[284] Huang Kaijie [黄恺杰], Wang Jian [王剑], and Chen Jiongyi [陈炯峄], "A Large Language Model Based SQL Injection Attack Detection Method ["一种基于大语言模型的 SQL 注入攻击检测方法"], *NetInfo Security* [信息网络安全], November 2023. For PLA researchers using an open source model that was already built on LLaMa and fine tuned, see Zeng Wenlong [曾文龙], Liu Dan [刘丹], and Zhang Chao [张超], "Intelligent Copy-Cleaning Based on Large Models: Event Key Point Extraction and Report Generation" ["基于大模型的智能抄清: 事件要点抽取与报告生成"], *Microcomputer and Its Applications* [微型机与应用], December 2023.

AMS and Beijing Institute of Technology researchers explained that they had fine-tuned the open source LLaMA-13B model to make their own custom model, named ChatBIT, which is "specifically optimized for dialogue and question answering tasks in the military field."[285] Another 2024 article coauthored by PLA AMS and NUDT researchers developed their own LLM, "Intent-Aware and Hate-Mitigating Counterspeech Generation," that is, generating text to oppose online speech the PLA researchers deem undesirable.[286] These AMS and NUDT researchers benchmarked their model's performance against Meta's LLaMa2-chat and OpenAI's GPT3.5, suggesting access to and use of them. The Chinese defense industry is also moving to adopt open source LLMs explicitly for CDO, as a June 2024 article by researchers from China State Shipbuilding Corporation's 714th Research Institute proposed a "technical roadmap for training military vertical domain large-scale models based on open source models" that specifically references CDOs as one potential application.[287] Moreover, the Chinese government's National Supercomputing Network has already made a "secure" version of LLaMa 3 available for Chinese researchers, likely including for PLA researchers.[288] Finally, OpenAI revealed that Spamouflage had used ChatGPT to produce text in foreign languages by May 2024.[289]

Potential Limitations and Challenges

Despite the dramatic improvement generative AI offers, there are still some significant limitations that are worth considering, although we argue Beijing will be able to overcome most of these. We have summarized these in Table 5.1.

Table 5.1. Potential Constraints on Generative AI for Social Media Manipulation

Challenge	Alternative Solution	Difficulty to Overcome
New models are pricey, require lots of computing power to build	Use and fine-tune an existing model, accepting suboptimal results	Relatively easy

[285] Zhang Huaping [张华平], Li Chunjin [李春锦], Wei Shunping [魏顺平], Geng Guotong [耿国桐], Li Weiwei [李伟伟], and Li Yugang [李玉岗], "Large Language Model-Driven Open-Source Intelligence Cognition" ["大语言模型驱动的开源情报认知认领"], *National Defense Technology* [国防科技], March 2024.

[286] Haiyang Wang, Zhiliang Tian, Xin Song, Yue Zhang, Yuchen Pan, Hongkui Tu, Minlie Huang, and Bin Zhou, "Intent-Aware and Hate-Mitigating Counterspeech Generation via Dual-Discriminator Guided LLMs," *Proceedings of the 2024 Joint International Conference on Computational Linguistics, Language Resources and Evaluation*, 2024.

[287] Cai Lei [蔡磊], Meng Xianbo [孟宪波], Han Dongmei [韩冬梅], and Xiao Zhenhua [肖振华], "Applications of Large-Scale Models in the Military Vertical Domain" ["大模型在军事垂直领域的应用"], *Ship Science and Technology* [舰船科学技术], Vol. 46, No. 5, June 2024.

[288] "There Is a Chinese Guide! 'One-Click' to Start the Experience! Llama 3 Is Online" ["有中文指南！'一键'开启体验！Llama 3 上线"], SCNet [超算互联网], April 25, 2024.

[289] OpenAI, 2024b.

Challenge	Alternative Solution	Difficulty to Overcome
Only as good as the data underlying the models	Leverage open-source data sets, accepting suboptimal results	Moderate
LLMs have limited memory	No direct solution, but memory is rapidly improving	Moderate
Authoritarian need for narrative control	Highly regulate models, perhaps imposing higher costs, slower deployment, or less-effective messaging	Politically difficult for China (and likely others)

First, developing new models is expensive and requires immense computing power. Moreover, the requirements for developing frontier models are still growing, making this not a one-time cost but a continuous process to keep up with global progress. For example, OpenAI's GPT-3 (circa 2020) cost an estimated $4.5 million to train, while GPT-4 (circa 2023) cost at least $100 million, with industry leaders projecting the cost of developing a cutting-edge model in 2024 could reach $1 billion. In 2025, that number could perhaps be $10 billion.[290] While the Chinese military has an expansive budget, and China's status as the second largest economy in the world confers an immense monetary advantage on the Chinese government, the decision to develop cutting-edge models will soon be immense, reflecting a strategic-level allocation of resources. Beijing may well elect to follow such a path, having already committed tens, if not hundreds, of billions of dollars toward developing its semiconductor industry, all for modest results.[291] China's overall ability to develop cutting-edge models will also eventually be constrained by U.S. export controls, although the Chinese government is likely resourceful enough to procure sufficient quantities of foreign technology to develop a limited number of such models. Alternatively, Beijing could leverage foreign computing power and/or use slower domestically produced chips.

The main solution to the first problem is simply to use—and specifically fine tune—existing publicly available open-source models. This will inherently require Beijing to accept suboptimal performance, but for the purposes of foreign influence operations, the bar for performance is very likely to be much lower than for U.S. commercial standards.

Second, AI models are only as good as the underlying data. OpenAI's GPT-4 excels in part because the company scraped an immense amount of information from the internet, although the specific amount is not known (GPT-3 uses 570 gigabytes of data, the equivalent of over 350 million pages of text).[292] The main solution here would be to leverage open-source data sets and accept suboptimal results. Again, Beijing's requirements for foreign influence operations will very likely accept this trade-off. However, if Beijing is politically constrained in its use of

[290] David Meyer, "The Cost of Training AI Could Soon Become Too Much to Bear," *Fortune*, April 4, 2024.

[291] Julie Zhu, Kevin Huang, Yelin Mo, and Roxanne Liu, "Exclusive: China to Launch $40 Billion State Fund to Boost Chip Industry," Reuters, September 5, 2023.

[292] Melissa Heikkilä, "OpenAI's hunger for data is coming back to bite it," *MIT Technology Review*, April 19, 2023.

data, requiring utilizing PRC data sets, this raises an inherent tension. The fact that Beijing so aggressively censors online conversations and injects propaganda-driven media means that at least some of the conversations on Chinese social media do not actually reflect how people think and may be highly unique to China's online environment.[293] Under the programmer's mantra of garbage in, garbage out, it seems that PRC-based generative AI will have to contend with data quality. It remains conjecture at this point but seems a reasonable point of friction that a PLA-managed, purpose-built generative AI with IO applications would need to know the "true" state of the world—ethnicities, demographics, political leanings, and international borders—to successfully manipulate, influence and persuade domestic and international masses to a new narrative.

Third, LLMs have limited memory, meaning that they are at risk of shedding their human-sounding qualities if conversations run on long enough because of their limited context window. This is because the requirements for computing memory are quadratic—for every doubling of memory, the resources required quadruple. This is an inherent limit to LLMs, but new programming advances are constantly improving LLM's memory performance, so we argue that this shortcoming will be attenuated over time.

Last, but likely most important, we argue that the authoritarian need for narrative control is likely, in practice, to be the biggest constraint on Beijing's adoption of generative AI for social media manipulation.[294] Despite the covert nature of some of China's foreign influence efforts, it appears that most, if not all, CCP-produced disinformation ultimately must still conform to CCP-approved domestic narratives. Put another way, Chinese propagandists appear limited in what they can actually produce, regardless of whether alternative messages might be more appealing or convincing to foreign target audiences. For example, the disinformation on Western social media platforms surrounding the Hong Kong protests in 2019 was mostly poor translations of Chinese domestic propaganda.[295] More recently, Microsoft's April 2024 report on foreign influence operations documented multiple examples of China-attributed activity, but these were

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[293] For an example of China's inability to closely track its true gross domestic product, see Michael Pettis, "What Is GDP in China?" Carnegie Endowment for International Peace, January 16, 2019.

[294] For more on this, see Li Yuan, "Why China Didn't Invent ChatGPT," *New York Times*, February 17, 2023; David Bandurski, "Bringing AI to the Party," China Media Project, April 14, 2023; Helen Toner, Jenny Xiao, and Jeffrey Ding, "The Illusion of China's AI Prowess: Regulating AI Will Not Set America Back in the Technology Race," *Foreign Affairs*, June 2, 2023; Chang Che and Olivia Wang, "What Happens When You Ask a Chinese Chatbot About Taiwan?" *New York Times*, July 14, 2023; Robyn Mak, "Chinese AI Arrives by Stealth, Not with a Bang," Reuters, July 27, 2023. See also Eddie Yang and Margaret E. Roberts, "The Authoritarian Data Problem," *Journal of Democracy*, Vol. 34, No 4, October 2023; Eddie Yang, "The Limits of AI for Authoritarian Control," working paper, August 2023.

[295] See for example, Conger, 2019; John Dotson, "Chinese Covert Social Media Propaganda and Disinformation Related to Hong Kong," *China Brief*, Vol. 19, No. 16, September 6, 2019.

still aligned with domestic propaganda—for example, accusing the United States of "water hegemony."[296]

The consequences of regulating these models so much are not abstract. First, it will likely impose higher costs and slow deployment of domestic LLM development, since Chinese companies will have to spend more time and human labor refining their models after initial training. Second, it may well produce less-effective messaging because models' overall performance generally declines the more they are adjusted after initial training.

Generative AI is Already Improving Chinese Social Media Manipulation

Early evidence suggests that Party-state actors have begun experimenting with leveraging generative AI for improved performance. At the start of our research in fall 2022, the idea of Chinese adoption was just a theoretical possibility. The first evidence of Chinese military interest came in spring 2023, when *PLA Daily* began addressing ChatGPT and when PLA researchers openly discussed the promise for CDOs.[297] Perhaps unsurprisingly in retrospect, this was also around the same time that the first known use of generative AI occurred. In September 2023, Microsoft reported that

> [s]ince approximately March 2023, some suspected Chinese IO assets on Western social media have begun to leverage generative artificial intelligence (AI) to create visual content. This relatively high-quality visual content has already drawn higher levels of engagement from authentic social media users . . . . Users have more frequently reposted these visuals.[298]

As a previous RAND report noted that "this appears to be more likely early, small-scale experimentation rather than reflect rapid broader adoption by known Party-state actors." While this suspected adoption is for text-to-image generative AI models, it is harder to identify text-generation models; thus, it is possible that experimentation on this front was also already ongoing.

The first signs of concerted adoption toward a specific campaign came in a fall 2023 effort that saw a notable improvement that may well be attributable to the adoption of generative AI. First, in August, Microsoft attributed the use of text-to-image generative AI models to make inauthentic images around the wildfires in Hawaii to Spamouflage.[299] The same month, Spamouflage had similarly targeted Japan's release of treated wastewater from the Fukushima

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[296] Microsoft Threat Intelligence, 2024.

[297] Thomas Shrimpton, "People's Liberation Army Exploring Military Applications of ChatGPT," U.S. Army Training and Doctrine Command, Foreign Military Studies Office, May 1, 2023; Irene Zhang, "The PLA on Generative AI," ChinaTalk, May 24, 2023; Beauchamp-Mustafaga, 2024.

[298] Microsoft Threat Intelligence, *Sophistication, Scope, and Scale: Digital Threats from East Asia Increase in Breadth and Effectiveness*, Microsoft, September 2023, p. 6.

[299] David Sanger and Steven Lee Myers, "China Sows Disinformation About Hawaii Fires Using New Techniques," *New York Times*, September 11, 2023.

nuclear accident recovery.[300] Later, a December 2023 ASPI report revealed a "new campaign (which ASPI has named 'Shadow Play') [that] has attracted an unusually large audience and is using entities and voice overs generated by artificial intelligence (AI) as a tactic that enables broad reach and scale."[301] ASPI found that the

> coordinated inauthentic influence campaign originat[ed] on YouTube [and promotes] pro-China and anti-US narratives in an apparent effort to shift English-speaking audiences' views of those countries' roles in international politics, the global economy and strategic technology competition.

This campaign was assessed to use text-to-image; text-to-speech; and, possibly, text-to-video models together to make video essays. While the suspected accounts were created in mid-2022, the generative AI content appears to have been employed by at least October 2023, suggesting midstream adoption as the campaign evolved.[302] Most important, ASPI concluded that "[t]he substantial number of views and subscribers suggest that the campaign is one of the most successful influence operations related to China ever witnessed on social media." Finally, ASPI concluded that it was more likely than not that the entity behind the campaign was a Chinese commercial company working for a PRC government organization because the tactics, techniques, and procedures were distinct from those of Spamouflage or other known Chinese actors. This raises the possibility that Chinese private companies are the first movers in China for generative AI and that the Chinese government is moving slower.

The first high-profile deployment of these capabilities came during Taiwan's January 2024 election. The Taiwanese government had already considered this to be a concern, and that appears to have come true.[303] Taiwanese intelligence sources told Taiwanese media that suspected Chinese IO actors were posting fake videos, likely using text-to-speech and perhaps text-to-image generative AI models, beginning by at least early January 2024 on a variety of social media platforms popular in Taiwan.[304] However, despite nongovernment analysts remarking that it was the largest identified campaign, it appears that "the content did not generate high rates of engagement due to the low production quality," perhaps in part because the source content for the videos was a fake 300-page book about President Tsai Ing-wen.[305] This preference for generative AI-fueled videos mirrors the YouTube network, except for the low

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[300] Microsoft Threat Intelligence, 2024.

[301] Jacinta Keast, *Shadow Play: A Pro-China Technology and Anti-US Influence Operation Thrives on YouTube*, Australian Strategic Policy Institute, 2023.

[302] The ASPI report included one suspected YouTube video from January 2023, although the rest date after October 2023. See Keast, 2023.

[303] Shelley Shan, "China Might Use AI to Sow Chaos: NSB," *Taipei Times*, April 27, 2023; Chung Li-hua and Jonathan Chin, "China Could Use AI to Meddle in Polls," *Taipei Times*, June 24, 2023.

[304] Tsai Yung-yao and Jonathan Chin, "China Is Posting Fake Videos of President: Sources," *Taipei Times*, January 11, 2024.

[305] Tsai Yung-yao and Jonathan Chin, 2024.

engagement rate. Additionally, Microsoft reported that, on election day, suspected Chinese IO actors posted a fake video about Terry Gou, a third-party candidate who had withdrawn from the Taiwanese presidential race in November 2023, endorsing China's favored candidate in the race, Hou Yu-ih of the Kuomingtang.[306] This very likely used text-to-speech to imitate Gou's voice, and Gou quickly debunked the video. In Microsoft's review, Chinese IO actors leveraged generative AI to make inauthentic images, audio, and video targeting Taiwan's elections, and at least some of the IO efforts targeting Taiwan were from the Spamouflage network, suggesting some adoption by Party-state actors as well.

An April 2024 Microsoft report reviewed Chinese IO efforts over the second half of 2023 and early 2024 to leverage generative AI. The report stated that these efforts were of "increasing volume and frequency."[307] Microsoft researchers discovered that

> Chinese influence campaigns continued to refine AI-generated or AI-enhanced content. The influence actors behind these campaigns have shown a willingness to both amplify AI-generated media that benefits their strategic narratives, as well as create their own video, memes, and audio content.[308]

These efforts have targeted wide-ranging audiences, such as "campaigns stoking divisions within the United States and exacerbating rifts in the Asia-Pacific region—including Taiwan, Japan, and South Korea." Moreover, "these campaigns have evolved in several important ways including incorporating AI-generated photos to mislead audiences, stoking conspiratorial content—particularly against the US government," along with "AI-generated memes targeting the United States that amplified controversial domestic issues," as well as "targeting new populations, such as South Korea, with localized content." Microsoft found that Spamouflage is the "most prolific" but that many other Chinese IO actors began leveraging generative AI over 2023 as well. However, while there does seem to be some improved performance with generative AI, Microsoft found that "these campaigns achieved varying levels of resonance with no singular formula producing consistent audience engagement," which suggested mixed results.

Microsoft identified several different types of generative AI content that Chinese IO actors produced over 2023 and early 2024:[309]

1. AI-generated anchors, specifically Spamouflage, which Beijing has used since at least late 2022, predating the rise of text-to-video generative AI models, but Microsoft found a greater use over late 2023 and early 2024[310]
2. AI-enhanced videos—deepfakes—which again predate the rise of text-to-video models.

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[306] Microsoft Threat Intelligence, 2024.

[307] Microsoft Threat Intelligence, 2024.

[308] Microsoft Threat Intelligence, 2024.

[309] Microsoft Threat Intelligence, 2024.

[310] For more on this, see Graphika, *Deepfake It Till You Make It: Pro-Chinese Actors Promote AI-Generated Video Footage of Fictitious People in Online Influence Operation*, February 2023.

3. AI-generated memes, presumedly leveraging text-to-image models, which targeted Taiwan's January 2024 elections, at least partially.

Looking forward, foreign analysts expect Beijing to continue expanding its adoption of generative AI for its influence operations. As of mid-2024, Microsoft analysts have noticed that, in contrast with Russia, which recently appears to have backed off its generative AI efforts and returned to its traditional human-produced content, Beijing appears to be continuing to leverage generative AI.[311] Similarly, Graphika assessed:

> Spamouflage and other Chinese IO actors will very likely continue to experiment with and expand on new tactics, techniques, and procedures, including using generative AI tools to create deceptive content and scale their activities, developing higher-quality inauthentic personas, and co-opting authentic online voices, such as social media influencers.[312]

Conclusion

The advent of generative AI has finally delivered the technical capability to realize Li's early vision for an AI-driven social media manipulation system. A review of Li's technical writings on text generation finds that he was consistently doing good work in the NLP field, and while he may not be as truly innovative as he claims, he keeps up with global research trends. In light of this, we argue he is well-placed to leverage generative AI. Given China's strong tech sector and growing generative AI prowess, coupled with the broad availability of powerful open-source models, there is every reason to expect that Li and the broader Party-state apparatus will move to adopt generative AI. Indeed, we argue that his December 2023 patent filing demonstrates he is moving toward adopting this technology, and other early evidence of Party-state use of generative AI for social media campaigns suggests broader adoption is likely.

The April 2024 reorganization of the PLASSF may also have some bearing on China's adoption of AI for its influence operations, although this is up in the air. Since the new PLACSF will be reporting directly to the Central Military Commission, it is possible that they will receive greater support—resources and perhaps authorities—that could enable them to adopt new technologies, such as AI, faster. However, another possibility is that the closer connection with the CMC will bring greater scrutiny that will lead to greater restraint for employing such capabilities.

Finally, given the MFA's October 2023 call for a global consensus against using AI for foreign interference, it is notable (although perhaps unsurprising) that we were unable to identify PLA or broader Party-state writings that explicitly, or even implicitly, called for exercising

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[311] Sydney J. Freedberg, "Deepfakes Deepfail: Russian Propagandists Turn Away from Generative AI," Breaking Defense, September 5, 2024.

[312] Graphika, 2024.

restraint on Beijing's embrace of AI for this purpose.[313] Suffice it to say, the MFA's public call appears by all accounts divorced from the actual internal planning and behavior of the Party-state. While it will be important to watch whether any such calls for restraint permeate Chinese discussions, the United States and like-minded countries should be ready to call Beijing out for failing to live up to its own pledges.

The next chapter explores Li's other writings for additional insights into PLA thinking on social media manipulation and broader cyber-enabled influence operations.

[313] The authors thank John Chen for this point.

Chapter 6. Additional Insights from Li Bicheng's Research

Beyond exploring how to leverage AI for cyber-enabled influence operations, Li's writings also provide insights into a host of other relevant topics. This chapter reviews Li's published work for their revelations about PLA threat perceptions, explicit interest in U.S. social media, explicit evidence of a desire to spread disinformation, the importance of data, assessed shortcomings of previous PLA efforts, considerations of IO as a warfighting function, efforts to leverage military-civil fusion, and nascent interest in leveraging cognitive science for improved effectiveness.

Heightened Threat Perception and Different Tit-for-Tat Framing

Li's articles clearly indicate that he views his research as supporting China's response to U.S. and Western actions, with China on the defensive and late to the great power game, which is consistent with broader PLA and Chinese government views. This is also validated by U.S. government reports. Li clearly states in his 2016 article that "foreign countries have seen a succession of 'color revolutions'; West Asia and North Africa have been in constant turmoil; and sudden mass incidents have constantly been breaking out," the latter likely referring to Chinese domestic protests.[314] In 2017, Li similarly wrote that "the internet has already become a main front for the infiltration of Western culture and a main battlefield of ideological struggle."[315] His 2017 article made clear the specific threat to China:

> Currently, the West is launching an online ideological offensive toward China at the cognitive and societal level in an attempt to shake the foundations of the Chinese Communist Party's governance and China's socialist system. This is also an attempt to dissolve our political beliefs, concept of the overall situation, and organizational discipline; to separate the party and cadres from the masses; and to deny our culture, thereby completely toppling our country.[316]

This aligns with the dominant view in the PLA and broader Chinese government that China is merely responding in kind to ongoing foreign attacks.[317] Providing an early PLA authoritative view, the 2015 NDU *Science of Military Strategy* said,

> [s]ince the beginning of the 21st century, cyberspace has been used by some countries to launch "color revolutions" against other countries [. . . through] behind-the-scenes operations using social networking sites, such as Twitter and

[314] Li Bicheng [李弼程], 2016.

[315] Li Bicheng [李弼程], 2017.

[316] Li Bicheng [李弼程], 2017.

[317] For more on PLA views, see Beauchamp-Mustafaga and Chase, 2019.

> Facebook as the engine, from manufacturing online public opinion to inciting social unrest.[318]

Recent Chinese MFA white papers provide authoritative documentation of this continued threat perception. The February 2023 report on "U.S. Hegemony and Its Perils," includes many claims about U.S. government actions to subvert the CCP and other governments around the world.[319] Part of these claims include manipulating social media:

> In December 2022, The Intercept, an independent U.S. investigative website, revealed that in July 2017, U.S. Central Command official Nathaniel Kahler instructed Twitter's public policy team to augment the presence of 52 Arabic-language accounts on a list he sent, six of which were to be given priority. One of the six was dedicated to justifying U.S. drone attacks in Yemen, such as by claiming that the attacks were precise and killed only terrorists, not civilians. Following Kahler's directive, Twitter put those Arabic-language accounts on a "white list" to amplify certain messages.[320]

Similarly, a 2022 MFA white paper on the U.S. National Endowment for Democracy (NED) focused on the organization's purported role in undermining authoritarian regimes, including via social media.[321] Regarding Venezuela, it stated that,

> [i]n November 2021, Russia Today reported in an article that a string of recent US internal documents revealed how the United States meddled in the electoral process in Venezuela. Documents showed that US intelligence fronts weaponized social media to promote Venezuela's right-wing opposition, and assist their election to parliament, thus laying the foundations for Washington's appointment of Juan Guaido as the country's leader.[322]

It similarly blamed NED for the 2021 unrest in Cuba, accusing NED of "funding anti-Cuba forces to manipulate public opinion against the government" and that

> [i]n July, capitalizing on the surge of street protests in Cuba, NED churned out the fake news that "(more than) 100 protesters . . . are missing" and used internet robots to disseminate it. That was a malicious attempt to influence public opinion online and incite the Cuban people to overthrow their government.[323]

Li argues China should respond to this growing threat from the United States. In 2016, for example, Li was already framing his research as a "countermeasure" and argued "online public

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[318] Xiao Tianliang [肖天亮], ed., *Science of Military Strategy* [战略学], National Defense University Publishing House [北京国防大学出版社], 2015. This language has remained consistent in the 2017 and 2020 editions. See Xiao Tianliang [肖天亮], ed., *Science of Military Strategy* [战略学], National Defense University Publishing House [北京国防大学出版社], 2017; Xiao Tianliang [肖天亮], 2020.

[319] MFA, "US Hegemony and Its Perils," February 20, 2023a.

[320] MFA, 2023a.

[321] MFA, "Fact Sheet on the National Endowment for Democracy," May 7, 2022.

[322] MFA, 2022.

[323] MFA, 2022.

opinion struggle is becoming increasingly intense domestically and internationally."[324] In his 2020 article, Li cites Jiang Yuncang for his 2018 research tracking how "public opinion warfare against China has shown new qualities in terms of targets, content, and methods," and Li further notes that Jiang has proposed "new response concepts."[325] Li's 2020 article also points to historical case studies by Wang Ruxi and Cao Yu about the role of public opinion warfare in Kosovo and Iraq and, in Li's words, "points out that one should go tit-for-tat with an adversary in public opinion propaganda in order to cancel out its negative influence."[326] This view carries over into calls by other PLA researchers to develop such a capability. For example, a 2016 article by two researchers at the PLA's University of International Relations, now under NUDT, called for improving the PLA's "online active defense" [网络积极防御] capability.[327]

The 2020 MA thesis that Li supervised is more explicit about linking this to their research on text generation.[328] The thesis argues that

> In this context of increasingly fierce domestic and international dual conflicts, the credibility of relevant units and mainstream media has been damaged, resulting in an impact on their public opinion guidance functions. It is imperative to guide online public opinion. Among them, it is an effective means to put a large number of public opinion guidance posts with positive effects into the online public social media environment to reverse the trend of online public opinion.[329]

The thesis takes the example of Cambridge Analytica [剑桥分析］as a recognition—and warning—of the risks of the power of social media. The thesis notes that Cambridge Analytica used the user data it stole to

> build a psychological and behavioral analysis model, including clear and available information index results, such as personality, life satisfaction, political views, and even personal preferences, so as to accurately place political

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[324] Li Bicheng [李弼程], 2016.

[325] Jiang Yuncang [姜运仓], "Characteristics and Responses of the West's Public Opinion War Against China Under the New Situation" ["新形势下西方对华舆论战的特点及应对"], *Journal of Zhengzhou Aviation Industry Management Institute (Social Science Edition)* [郑州航空工业管理学院学报(社会科学版)], Vol. 37, No. 1, 2018. Although Jiang is affiliated with the Zhengzhou University of Aeronautics, not the PLA, Li may have been aware of him from his time at PLASSF IEU because they are located in the same city.

[326] Li Bicheng [李弼程] et al., 2020; Wang Ruxi [王汝茜], Cao Yu [曹宇], "An Analysis of Public Opinion Counterattack Strategies During Wartime" [战时舆论反击策略探析], *Research on Grassroots Political Work* [基层政治工作研究], No. 1, 2012.

[327] Liu Qiang [刘强] and Ge Hanwen [葛汉文], "The Online Public Opinion Warfare Strategy of Western Military Powers and Its Revelations" ["西方大国军队网络舆论战略及启示"], *Journal of PLA Nanjing Institute of Politics* [南京政治学院学报], Vol. 32, No. 1, 2016.

[328] Hu Shengwei [胡盛伟], 2020.

[329] Hu Shengwei [胡盛伟], 2020.

> advertisements and information content based on user interests and behavioral dynamics.[330]

In light of this, the thesis argues,

> [i]t can be seen that using personalized and customized network information to accurately induce the psychology of netizens is enough to influence or even change the decisions of netizens on major national issues. Even in international political and military struggles, by creating disinformation on the internet, disrupting and controlling the trend of public opinion in other countries and triggering a crisis of social trust, one can achieve the objective of interfering in the internal affairs of other countries.[331]

The response, then, is to "create a healthy environment for online public opinion, maintain the healthy and stable development of society, and prevent the spread of malicious and false information on the internet, it is imperative to strengthen the guidance of online public opinion."[332]

For the PLA, this threat perception is very likely validated in public reporting of U.S. government activities. For example, the August 2022 report by Graphika and the Stanford Internet Observatory Cyber Policy Center that identified and attributed pro-Western narratives on social media to the U.S. government fueled another round of immense concern from PLA researchers.[333] This was similar to earlier reporting in 2011 about DoD covert activity on social

[330] Hu Shengwei [胡盛伟], 2020.

[331] Hu Shengwei [胡盛伟], 2020.

[332] Hu Shengwei [胡盛伟], 2020.

[333] Graphika and the Stanford Internet Observatory Cyber Policy Center, 2022. For U.S. media coverage, See, for example, Ellen Nakashima, "Pentagon Opens Sweeping Review of Clandestine Psychological Operations," *Washington Post*, September 19, 2022. For PLA articles reacting to this news, see Fu Bo [傅波], "The U.S. Military Uses Social Media to Conduct Information Warfare" ["美军利用社交媒体开展信息战"], *China Defense News*, October 10, 2022; Hou Dawei [侯大伟], "Analysis on Improving the Quality and Effectiveness of Public Opinion Work in the All-Media Era" ["提高全媒体时代舆情工作质效论析"], *Military Correspondent* [军事记者], January 2023.

media, which also sparked years of PLA concerns.[334] The advent of ChatGPT and generative AI has further reinforced these concerns.[335]

U.S. government reports also assess that this Party-state activity is at least partly motivated by a sense of tit-for-tat retaliation. As DoD's 2023 report to Congress on the Chinese military explains,

> From the PRC's perspective, all nations—especially the United States—that use digital narratives to undermine the CCP's authoritarian system in China employ offensive influence operations. Hence, the PRC considers its influence operations that counter this perceived subversion as defensive in order to protect the party and the military.[336]

Similarly, the NIC's declassified 2022 report on foreign efforts to influence the 2022 U.S. midterm elections concluded that "PRC leaders most likely see their growing efforts to magnify US societal divisions as a response to what they believe is an intensified US effort to promote democracy at China's expense."[337]

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[334] Nick Fielding and Ian Cobain, "Revealed: U.S. Spy Operation that Manipulates Social Media," *The Guardian*, March 17, 2011. For some PLA views, see Chen Qingbao [陈庆宝], "Analysis on the U.S. 'Online Botnets' and Research on Countermeasures" ["对美国 '网络水军' 的分析及对策研究"], *Military Correspondent* [军事记者], December 2012; Zeng Huafeng [曾华锋] and Shi Haiming [石海明], *Command of the Mind: The Rules of War and National Security Strategy in the Global Media Age* [制脑权: 全球媒体时代的战争法则与国家安全战略], Academy of Military Science Press, 2014; Li Jidong [李继东] and Chen Zhou [陈舟], "On Strategic Cyber Warfare" ["试论战略网络战"], *China Military Science* [中国军事科学], December 2017; Chen Ting [陈廷], "Political Security Risks of Artificial Intelligence and Our Prevention and Control Countermeasures" ["人工智能的政治安全风险及其放空对策"], *China Military Science* [中国军事科学], October 2019.

[335] Ban Wentao [班文涛] and Xie Mingxiu [谢明修], "Three Reliances: Using Artificial Intelligence Technology to Innovate Public Opinion Warfare—Research and Enlightenment on the Application of Artificial Intelligence Technology to Public Opinion Warfare by the United States and Other Western Countries" ["三个依托: 利用人工智能技术创新舆论战: 美国等西方国家将人工智能 技术应用于舆论战研究与启示"], *Military Correspondent* [军事记者], January 2023; Meng Haohan [孟浩瀚] and Lan Peixuan [兰培轩], "Strategies to Generate Capabilities in Public Opinion Warfare in the Cognitive Domain: Thoughts and Warnings Brought to Us by the Public Opinion Dissemination of American and Western Media" ["认 知域下舆论战的能力生成之策: 美西方媒体舆论传播带给我们的思考和警示"], *Military Correspondent* [军事 记者], January 2023; Wang Hejing [王鹤静] and Wu Dan [吴丹], "Strategic Tactics of the U.S. Cyber Army" ["美 国网军的战略战法"], *Military Digest*, July 2023; Yang Yang [杨洋] and Hu Zhongjian [胡中健] "U.S. Military Network Covert Propaganda in the Era of Artificial Intelligence: Operational Changes and Inspiration" [人工智能时代美军网络隐蔽宣传: 行动变革及启示] *Journal of Intelligence* [情报杂志] No. 9, 2023; Li Jiahong [李佳泓], Huang Jia [黄嘉], and Gu Juxian [古炬贤], "Research on the Issues of Infiltration of Values in Natural Language Processing: Taking ChatGPT as an Example" ["自然语言处理中的价值观渗透问题: 以 ChatGPT 为例 认领"], *Journal of Intelligence* [情报杂志], August 2024.

[336] Office of the Secretary of Defense, 2023.

[337] NIC, 2022.

Interest in U.S. Social Media, Especially Its Role in U.S. Politics

Li's 2019 and 2020 articles also make clear Li's awareness of the role of social media in U.S. elections. In his opening literature review, Li cites U.S. research about "the formation process and influencing factors of public opinion during U.S. election periods and summarized the features of online public opinion surrounding U.S. elections."[338] Since Li's 2016 article was written before July of that year and published in October, he may have paid less attention to the U.S. allegations of Russian election interference via social media manipulation and other means from that election. But coming in 2019, Li may have been aware of that episode. In his 2020 article, Li also cites research by Wang Danna, a postdoctoral research fellow at Ministry of State Security Bureau 13, into "online public opinion warfare modes, responses, and prospects in the U.S. presidential elections."[339]

The case studies in the 2020 master's thesis that Li supervised provide further explicit evidence of their interest in U.S. politics and Li's deeper engagement with this topic.[340] While the student's three case studies of Chinese domestic online controversies were nonpolitical,[341] the fourth case study centered on former U.S. President Donald Trump's first impeachment [弹劾特朗普事件] over 2019–2020. Leveraging more than 90,000 English-language social media posts from Twitter (triple some of the domestic case studies), with the help of Chinese tech company Meiya Pico, the student trained the model, as described in Chapter 4, to produce tweets relevant to social media conversations about the impeachment. For example, one of the text-generation models that Hu developed during his research specifically outputs "trump is not a good president" as a possible comment on an original post saying, "but the president has not broken any laws." Similarly, for a tweet reading "lot of people think trump is good," this output is, "lot of people think trump is stupid." While other models he developed give slightly different responses, it is clear that Hu was specifically working on generating content that would have been highly tailored for U.S. political discourse on social media. In the end, Hu concludes that his "experimental results show that this method is feasible and effective, can effectively improve the generation effect of public opinion guidance text, and meets the engineering needs of

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[338] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019. Li cites James Druckman, Erik Peterson, and Rune Slothuus, "How Elite Partisan Polarization Affects Public Opinion Formation," *American Political Science Review*, Vol. 107, No. 1, 2013. A similar summary of Druckman, Peterson, and Slothuus (2013) appears in Li Bicheng [李弼程], 2017; Li Bicheng [李弼程] et al., 2020.

[339] Li Bicheng [李弼程] et al., 2020; Wang Danna [王丹娜], "Mode, Response and Outlook of Online Public Opinion Warfare in the US Election" ["美国大选网络舆论战模式, 应对与展望"], *China Information Security* [中国信息安全], September 2019. For CNITSEC affiliation, see Peter Mattis and Matthew Brazil, *Chinese Communist Espionage: An Intelligence Primer*, United States: Naval Institute Press, 2019.

[340] Hu Shengwei [胡盛伟], 2020.

[341] The case studies were "Wang Yuan Smoking Incident" ["王源吸烟事件"], "Lang Lang Doesn't Help Wife with Bags Incident" ["朗朗不帮妻子拿行李事件"], and "Food Connoisseur Wang Gang Apology Incident" ["美食家王刚道歉事件"] (Hu Shengwei [胡盛伟], 2020).

generating online review posts." While the ultimate use case of this part of Hu's research is unclear, the fact that Li not only supervised but also funded Hu's thesis and coauthored with Hu suggests a close relationship that opens the possibility Li could make use of this part of Hu's research for his own efforts. This aligns with other PLA master's student research, explicitly framed around "social media warfare," which scraped Twitter data from 30 senior officials in the Biden administration, including President Biden's own official account and all his cabinet secretaries.[342]

Evidence for Generating Disinformation and Manipulating Foreign Social Media

Li's interest in generating disinformation or otherwise manipulated content is also clear from his research. Most obviously, as noted in Chapter 4, is his overarching desire to artificially shape online public opinion under the guise of guidance. More specifically, his reference in 2016 to a desire to improve the ability to conduct "online information deception" [网络信息欺骗] reveals an acknowledgement for what this content really is.[343] Relatedly, his discussion in the same 2016 article about the capabilities he envisions as part of "online public opinion information production" [网络舆论信息制作] include: "speech synthesis technology" [语音合成技术], "imaging/video stitching technology" [图像/视频拼接技术], and "multimedia camouflage technology" [多媒体伪装技术].[344] This provides several clear pieces of evidence that the PLA is actively working to manipulate public opinion via social media. We can tell that Li is interested specifically in manipulating foreign social media for multiple reasons. First, there is his discussion of specific foreign platforms, such as Facebook and Twitter. Second, he supervised related research about generating English-language comments about U.S. politics. And finally, there is Li's criticism of PLA IO as easy to identify and remove, which assumedly would not be a major issue for Chinese-owned domestic social media platforms under the CCP's control.

Li also indirectly but obviously addresses how he seeks to deliver the content he is generating: fake accounts. In his 2020 coauthored article, Li mentions "account cultivation" [账号培育] as a requirement for his AI-driven vision, which clearly suggests inauthentic

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[342] Xia Rongjing [夏榕璟], "Research on English-Chinese Neural Machine Translation of Social Networks for Military-Political Domain" ["面向军政领域的社交网络英汉神经机器翻译研究"], master's thesis for PLASSF Information Engineering University [战略支援部队信息工程大学], 2022. For analysis, see Nathan Beauchamp-Mustafaga and Jackson Smith, "Cognitive Domain Operations Against Vietnam Hint at Broader Ambitions," *China Brief*, June 2024.

[343] Li Bicheng [李弼程], 2016.

[344] Li Bicheng [李弼程], 2016.

accounts.[345] This is repeated in other PLA-affiliated research as well.[346] For example, a 2023 article explains,

> In particular, it is necessary to directly control a number of accounts with flexible identities [身份灵活] and great influence on various platforms, so as to timely expose conspiracies [揭露阴谋], refute rumors [批驳谣言], clarify fallacies [澄清谬误], and effectively guide public opinion in a direction that is beneficial to us, so as to gain opportunities for cognitive attacks and counterattacks.[347]

Similarly, a March 2022 article by a PLA NDU researcher argued that, "on the basis of cracking the enemy's ability to verify the account information for social bots, the social bots will complete public opinion struggle and intelligence collection tasks."[348]

While Li appears to have done limited work on image generation specifically, others in the PLA are working on this. For example, a 2021 NUDT master's thesis focused on using GANs to generate highly precise images based on specific user inputs of desired adjustments to just one source image.[349] The thesis was supervised by NUDT professor Lao Songyang, who has been interested in manipulated video since at least the early 2010s and participated in a large NUDT research project on the topic, suggesting continued PLA interest and an effort to continue improving such capabilities.[350] The author explains that the thesis is "dedicated to assisting the development of cognitive domain operations" by "provid[ing] an optional solution for multimedia information processing, especially image editing," in support of "creat[ing] images for false intelligence [假情报] and false public opinion [假舆论] to achieve the purpose of

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[345] Li Bicheng [李弼程] et al., 2020.

[346] For a reference to "carrying out account creation" [开展账户创建] and "virtual communication body account" [虚拟传播主体账号], see He Yu [何宇] and Zhang Hua [张化], "Winning Mechanism and Advanced Technology of 'Cognitive Intelligent Operations'" ["认知智能作战"制胜机理及前沿技术"], *National Defense Technology* [国防科技], January 2023. For broader PLA interest in the late 2010s about opening accounts on Western social media (overt or otherwise), see Beauchamp-Mustafaga and Chase, 2019.

[347] Hou Dawei [侯大伟], 2023.

[348] Long Yameng [龙亚蒙] and Zhou Yang [周洋], 2022.

[349] Li Xinwei [李欣烤], "High-Resolution Multi-Object Scene Image Generation Technology Based on Generative Adversarial Network" ["基于生成对抗网络的高分辨率多目标场景图像生成技术"], master's thesis, National Defense University of Technology [国防科技大学], 2021.

[350] See, for example, Guo Xiaoyi [郭小一], Lao Songyang [老松杨], and Qin Zhen [秦振], 2010; Guo Xiaoyi [郭小一], Lao Songyang [老松杨], and Wu Xiaoxi [吴晓曦], "Research on Psychological Warfare Video Information Product Development Systems" [心理战视频信息产品开发系统研究], *Military Operations and Systems Engineering* [军 事运筹与系统工程], Vol. 24, No. 2, June 2010; Bu Jiang [卜江], Lao Songyang [老松杨], Bai Liang [白亮], and Liu Haitao [刘海涛], "Research on the Mechanism of Video-Based Implied Psychological Operation" [基于视 频的心理暗示作战机理研究], *Journal of the Academy of Equipment Command and Technology* [装备指挥技术学 院学报], Vol. 22, No. 4, August 2011. For more analysis of the NUDT project, see Beauchamp-Mustafaga, 2023a.

implementing strategic misdirection [战略欺诈].”[351] The author later adds that it can specifically be used for CDOs “to interfere with enemy judgment and decisionmaking” and also “achieve a surprising victory by exerting public opinion pressure on the opponent and creating information fog.”[352]

The author explains that his improvements are in better controllability of the generated image and lower requirements for source images—just one will do, apparently. The author notes that the PLA struggled (as of 2021) with generating fake images due to “high [model] training cost, large demand for training samples, low resolution of generated images, and poor controllability,” and separately complains about how long the process takes.[353] This would suggest limited success for 10 years of PLA efforts (and that of his professor). The author explains that

> the new model can generate multiobject scene images under data scarcity conditions. Through artificial control conditions, the number and distribution of objects in the generated multiobject scene images can be controlled. Therefore, the model can be used to generate film and television scenes with less image materials. . . . It takes into account the scarcity of training materials caused by the scarcity of generated images, as well as the high quality of images required in film and television production and cognitive domain operations.[354]

The true advancement, in the author’s words, is the “improved controllability and realism of the generated images. The single image deep generation function also makes this technology closer to practical application.”[355] The NUDT student thus claims to have fixed the PLA’s limited ability to generate fake images from just a single source and its limited ability to precisely control the desired output image. In the thesis, the test images are adding an additional fighter to a photo. Looking ahead, the author explains that his model does not work for video, so the PLA should work on developing deepfakes for CDO.

One key component of this will likely be the PLA’s translation capabilities. Although the PLA has historically been weak in foreign language skills, according to PLA researchers, AI and, specifically, machine translation are likely to improve this capability.[356] One major proponent of this evolution has been PLA IO expert Liang Xiaobo of NUDT, who in a 2020 article argued that the rise of AI will make military translation

> evolve from simple artificial language translation to intelligence collection, multilanguage intelligent support equipment for individual actions, large-scale

[351] Li Xinwei [李欣烤], 2021.

[352] Li Xinwei [李欣烤], 2021.

[353] Li Xinwei [李欣烤], 2021.

[354] Li Xinwei [李欣烤], 2021.

[355] Li Xinwei [李欣烤], 2021.

[356] For more on PLA interest in machine translation, see Beauchamp-Mustafaga and Smith, 2024.

> social psychological cognition, culture and behavior judgment, large-scale multilanguage data rapid translation, and intelligence processing.[357]

This is currently one aspect that Li's research has not yet focused on but that will be important to monitor in the future.

The Importance of Data, Especially Open-Source Data

Given the reliance on AI, data are also a key consideration. Li, in his 2019 article, states that "the vast amount of information collected on users' online behavior and post content is used to create models of simulated people and conduct post generation training for intelligent agents."[358] This suggests that Li is aware of data-collection efforts that are either specifically focused on providing data for training models, or otherwise this collected data can be repurposed for this. Although it is difficult to know what specific data Li is referring to, there are several options. For example, Shenzhen Zhenhua Data Information Technology Co., a subsidiary of CETC that directly supports the Chinese military, was revealed in September 2020 to have collected both open-source and not publicly available information on over 2 million people, including prominent foreign politicians and military service members.[359] This leaked dataset, known as the Overseas Key Information Database, would likely be just the kind of information that Li would want to harness for his efforts. More broadly, foreign research has shed light on the myriad ways the broader Party-state collects these vast troves of global data, whether directly or via Chinese private companies.[360]

The most important company supporting Li's research appears to be Xiamen Meiya Pico Information Co., which is a Chinese tech company known for digital forensics and data collection, among other services.[361] Li's collaboration with Meiya Pico is especially interesting, given the company's close ties to China's security services and role in promoting military-civil fusion within the PRC technology sector. The U.S. government blacklisted the company in 2019

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[357] Liang Xiaobo [梁晓波], "When Language Weapons Meet Artificial Intelligence" ["当语言武器邂逅人工智能"], *PLA Daily*, July 14, 2020.

[358] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019.

[359] See, for example, Gerry Shih, "Chinese Firm Harvests Social Media Posts, Data of Prominent Americans and Military," *Washington Post*, September 14, 2020b; Daniel Hurst, Lily Kuo, and Charlotte Graham-McLay, "Zhenhua Data Leak: Personal Details of Millions Around World Gathered by China Tech Company," *The Guardian*, September 14, 2020.

[360] Hoffman, 2019; Shan Li and Philip Wen, "This App Helps You Learn About China, While China Learns All About You," *Wall Street Journal*, October 14, 2019; Devin Thorne, "Evaluating the Utility of Global Data Collection by Chinese Firms for Targeted Propaganda," *China Brief*, October 30, 2020b; Hoffman and Attrill, 2021; Cadell, 2021.

[361] See Huaqiao University [华侨大学], "Xiamen Ansheng Network Technology Co., Ltd. (a Subsidiary of Meiya Pico) Recruitment Brochure" ["厦门安胜网络科技有限公司（美亚柏科子公司）招聘简章"], webpage, October 22, 2020; Celia Chen and Meng Jing, "What You Need to Know About Meiya Pico, China's Low-Profile Forensics Champion Named in Data Privacy Scandal," *South China Morning Post*, July 9, 2019.

for its support to the Chinese government for surveillance efforts in Xinjiang.[362] While most foreign attention on Meiya Pico focuses on its support to the MPS, Li's ongoing relationship with the company suggests it could also be supporting the PLA and/or UFWD. Li coauthored two articles with a researcher at Meiya Pico in 2019 and 2020 that focused on better understanding how public opinion evolves online, which involved some amount of social media data.[363] Also in 2019, employees at Meiya Pico filed for a Chinese patent and listed Li as an inventor.[364]

The most revealing support from Meiya Pico to Li's research comes in a 2020 master's thesis he supervised.[365] The student explains that "[t]hrough cooperation with Xiamen Meiya Pico Information Co., Ltd., we obtained some online comment [post] data on these hot public opinion events." He also discloses that he participated in two joint research projects with Meiya Pico, assumedly facilitated by Li, that were titled, "Internet Topic Event Information Extraction" [互联网话题事件信息抽取] and "Construction of Knowledge Graph and Its Application" [知识图谱构建及其应用].[366] The fact that Meiya Pico was able to supply Twitter data on U.S. political issues meant that it had either already collected the data as part of normal business operations or specifically collected it for the purposes of supporting Li's student (and likely Li's own research).

Finally, Li's research leverages several open-source models and datasets. For example, because our survey of Li's research is from before the generative AI era, Li bases the research on affective text generation in his January 2023 article on the BERT family of models, adopting Zhang Yihe et al's PrOgressive INsertion-based TransformER (POINTER), He Xingwei's Constrained BART (CBART), and Welleck et al's Non-Monotonic Sequential Text Generation (NMSTG), among others.[367] As Li explained,

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[362] For more on Meiya Pico, see Louise Lucas and Emily Feng, "Inside China's Surveillance State," *Financial Times*, July 20, 2018; Chen and Jing, 2019; Fergus Ryan, Danielle Cave, and Vicky Xiuzhong Xu, *Mapping More of China's Tech Giants: AI And Surveillance*, Australian Strategic Policy Institute, November 2019. For more on the blacklisting, see Jenny Leonard and Nick Wadhams, "U.S. Weighs Blacklisting Five Chinese Video Surveillance Firms," Bloomberg, May 21, 2019; Adam Behsudi and Doug Palmer, "Trump Administration Blacklists Chinese Firms Linked to Surveillance of Uighur Minority," *Politico*, October 7, 2019.

[363] Xiong Yao [熊尧], Li Bicheng [李弼程], and Wang Ziyue [王子玥], "Analysis of Public Opinions in Network Communication Based on the Two-Level Communication Theory" ["基于两级传播理论的舆论超网络传播分析"], *CAAI Transactions on Intelligent Systems* [智能系统学报], Vol. 15, No. 5, October 2019; Xiong Yao [熊尧], Li Bicheng [李弼程], and Wang Ziyue [王子玥], "Fuzzy-Synthetical Evaluation of Online Public Opinion Guidance " ["基于模糊综合评判的网络舆论引导效果评估"], *Journal of Modern Information* [现代情报], Vol. 40, No. 6, June 2020.

[364] Wang Wei [王炜] et al., 2019.

[365] Hu Shengwei [胡盛伟], 2020.

[366] The project numbers were 605-54317109 and 605-54318086, respectively.

[367] Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], 2023.

> the affective text generation model with hard constraints is based on BERTlarge. This model was pretrained by Zhang's ordinary text structure wiki and Yelp dataset before constructing the pretraining data of the aforementioned structure base on the Res14 and Lap14 training sets.[368]

For data, Li used the SemEval Challenge series of datasets on sentiment, which is specifically English-language social media content, including U.S. political content from prominent U.S. politicians. Li also used the BLEU evaluation metric, among others. Finally, Li powers this work with Western open-source hardware and software: "The deep learning framework is Pytorch 1.3.1, the experimental system is Ubuntu20.04, it uses a GTX1080 display card, and the Python IDE [Integrated Development Environment] is Pycharm." This demonstrates how foundational Western open-source datasets and models are for Li's research and may well be for broader PLA cyber-enabled influence operations efforts.

Assessed Shortcomings of Chinese IO

Li is also very transparent in his criticism of Chinese influence operations, and these are consistent with broader PLA and Party-state internal assessments, surveyed later in this section. Li's 2016 article clearly identifies his assessment of China's shortcomings at that time: "weak theory, insufficient verifiable research, and a lack of operability."[369] The key to operationalizing the capability, Li argued, is improving the PLA's technology for online public opinion struggle: "Online public opinion struggle weapons and equipment have become a key issue in improving its operational results."[370] Li repeated these criticisms through at least 2020, and his 2019 article specifically criticized the "lack of strong theory, insufficient verifiable research, and a lack of operability," concluding that "online public opinion warfare technology and equipment has already become a bottleneck issue that limits online public opinion warfare."[371]

While Li's comments may be self-serving in the sense that he is proposing technical solutions that address these issues, his criticisms are still noteworthy for what they reveal about internal assessments of Chinese capabilities. For example, in his 2016 article, Li identifies five key items for improvement:[372]

1. *Better understand the cognitive domain*. Referred to as the *online cognitive domain* [网络空间认知域], Li argues that online public opinion struggle will expand from the traditional military domains of physical [物理域] and information [信息域] to the newer cognitive domain [认知域]. Thus, the PLA needs to improve its basic theoretical

[368] Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], 2023.

[369] Li Bicheng [李弼程], 2016.

[370] Li Bicheng [李弼程], 2016.

[371] Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], 2019. See also Li Bicheng [李弼程] et al., 2020.

[372] Li Bicheng [李弼程], 2016.

research, better understand the requirements for equipment and technology, and evaluate effectiveness (or efficiency), and develop an ability to assess whether the efforts are having the intended effects.

2. *Develop better capabilities*. Specific capabilities include surveillance (*online public opinion surveillance capabilities* [网络舆情监控能力]), guidance (*online public opinion guidance capabilities* [网络舆情引导能力]), censorship (*online information blocking capabilities* [网络信息封堵能力]), deception (*online information deception capabilities* [网络信息欺骗能力]), and delivery (*online information delivery capabilities* [网络信息投送能力]). The goal is to develop "integrated 'intelligence, guidance, attack, protection, and evaluation.'" Li's 2017 article adds an additional requirement for *efficiency evaluation* [效能评估].[373]
3. *Improve human capital*. This includes in academia and in broader workforce development. Li argues that "humans are a decisive element in winning and losing wars" and that "war theory, technology and equipment operation, and the formation of strategy and tactics are all tied to the quality of experts." Li argues then that the PLA needs a larger and better workforce with better organizational structure: "Currently, the state of Chinese online public opinion struggle personnel faces such issues as insufficient numbers, poor quality, and unreasonable structuring, all of which limit the extent to which operational efficiency can be improved." Li calls for better talent management, better instruction, more on-the-job training, and better leveraging of military-civil fusion.
4. *China should develop its own platforms and influencers*. Citing a need for *positive energy* [正能量] (pro-CCP content) online, Li calls for strengthening management of existing platforms and for China to create its own "online public opinion struggle platforms" [网络舆论斗争平台]. Li argues "we must combine various forces to establish a capable operational team, unite and shape opinion leaders [意见领袖], and prop up and cultivate our own Big Vs [大 V]."[374]
5. *Develop an "integrated joint operational system for online public opinion struggle"* [网络舆论斗争的一体化联合作战体制]. Li argues that these operations operate across domains, forces, and information systems, thereby requiring joint operational command to ensure operational success, including "top-to-bottom communication, unified command, and combined forces."

While the PRC has an ostensibly formidable array of tools at its disposal for cultivating and exerting international influence, its efforts to exert control within the global information environment have, in practice, been met with limited success. At the strategic level, this is evidenced by China's declining standing in international public opinion polls, which suggest that the PRC continues to struggle with managing its international image.[375] Moreover, at the

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[373] Li Bicheng [李弼程], 2017.

[374] *Big Vs* are verified user accounts on such platforms as Weibo with a large number of followers, also known as *influencers*.

[375] Laura Silver, Christine Huang, and Laura Clancy, "Negative Views of China Tied to Critical Views of Its Policies on Human Rights," Pew Research Center, June 29, 2022; Laura Silver, Christine Huang, and Laura Clancy,

operational level, PRC efforts to create specific outcomes, such as influencing electoral results in Taiwan and Australia, have produced only marginal success, with scant evidence to suggest that its IO played a decisive role in determining the result of those contests, as of 2020.[376]

Undoubtedly, this middling performance is due in large part to exogenous factors, such as the unappealing nature of China's authoritarian governance structure; its poor human rights track record; and its propensity to engage in diplomatically self-sabotaging behaviors, such as wolf warrior diplomacy. However, another contributing factor to this phenomena may be institutional shortcomings within the PRC's foreign propaganda work system that limit its effectiveness. This hypothesis appears to be borne out by self-assessments conducted by researchers employed by such institutions as CIIS, Xinhua News Agency's internal research bureau, and the China Institute of Contemporary International Relations [中国现代国际关系研究院], which are affiliated with the MFA, the Propaganda Department, and Ministry of State Security, respectively.[377] When viewing these sources in the aggregate, it is clear that there are a number of commonly voiced criticisms. These can be grouped into three main categories.

First, many Chinese Party-state-affiliated researchers acknowledge a lack of regional understanding and institutional capacity within Party-state organizations tasked with developing, disseminating, and conveying PRC viewpoints. While the superstructure of China's foreign influence apparatus is financially well-resourced—once assessed to be $10 billion or more per year—the quality of guidance from Beijing in enacting strategic communications is often rated as being insufficient.[378] There are a couple factors that play into this assessment. The first issue is the lack of a unified coordinating mechanism for harmonizing the efforts of relevant stakeholders tasked with strategic communications. Currently, responsibility for coordinating messaging and practice appears to be poorly delineated; it is likely split across a number of government authorities, such as the Central Foreign Affairs Commission [中央外事工作委员会], the "Belt and Road" Construction Work Leading Small Group ["一带一路"建设工作领导小组], and the Central Leading Small Group for Propaganda and Ideology [中央宣传思想领导小组].[379] There have been calls within some sectors to establish a new leading small group to oversee strategic

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"China's Approach to Foreign Policy Gets Largely Negative Reviews in 24-Country Survey," Pew Research Center, July 27, 2023a; Laura Silver, Christine Huang, and Laura Clancy, "In East Asia, Many People See China's Power and Influence as a Major Threat," *Pew Research Center,* December 5, 2023b.

[376] Sarah O'Connor, Fergus Hanson, Emilia Currey, and Tracy Beattie, *Cyber-Enabled Foreign Interference in Elections and Referendums*, Australia Strategic Policy Institute, October 28, 2020.

[377] These assessments were primarily drawn from journals, such as *Intelligence Science* [情报科学], *International Communications* [对外传播], and *Contemporary International Relations* [现代国际关系].

[378] David Shambaugh, "China's Soft-Power Push: The Search for Respect," *Foreign Affairs*, Vol. 94, No.4, July/August 2015. For an argument for a higher estimate, see Anne-Marie Brady, "Plus Ça Change? Media Control Under Xi Jinping," *Problems of Post-Communism*, Vol. 64, No. 3, 2017b.

[379] Alice L. Miller, "More Already on the Central Committee's Leading Small Groups," *China Leadership Monitor*, No. 44, July 28, 2014.

communications efforts across the entirety of the Party-state apparatus.[380] However, no group had been established as of this report's drafting in late 2023, even in the wake of the 20th Party Congress.

This institutional stove-piping is not limited to leadership but extends down to the grass-roots level. Linkages between foreign policy experts in China's think-tank sphere and their counterparts in government and the private sector are organized haphazardly. This negatively affects their ability to develop and disseminate concepts and theories that can achieve widespread appeal internationally. For instance, publicly available assessments by CIIS researchers (under PRC MFA) have criticized China's think-tank sphere as being overly insular and lacking the proper dissemination channels to share their findings to policymakers and practitioners.[381] The end result is that PRC messaging tends to use a one-size-fit-all approach, limiting its ability to resonate with foreign audiences, although some in China are working to address this.[382]

Second, PRC influence efforts suffer from poor content quality and overreliance on outdated legacy media to convey information.[383] Across the board, Chinese academicians and government-affiliated officials tend to regard the quality of the PRC's external messaging as being comparatively poor. These criticisms extend to both the content and distribution capacity for messaging. With regard to content, a common criticism is that PRC media affiliates attempt to use "[domestic] propaganda methods" internationally, limiting their communicative potential.[384] This is compounded by the fact that China's foreign-facing outlets often do not hire employees with local language and cultural expertise.[385] The result is that products produced by PRC state media are often stylistically lacking. This dynamic is illustrated by a 2019 assessment by a CIIS researcher that harshly criticized the state of PRC external messaging efforts,

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[380] Li Mo [李沫], "Strategic Communication: The Battle for the Frontier of National Interests" [战略传播: 国家利益争夺前沿的较量], *China National Defense* [中国国防报], December 8, 2016; Ye Shulan [叶淑兰], "Building China's International Voice: Achievements, Challenges and Deepening Paths" ["中国国际话语权建设: 成就, 挑战与深化路径"], China Institute of International Studies [中国国际问题研究院], 2021.

[381] Jiangsu Think Tank [江苏智库], "International Communication Capacity Building of Chinese Language Think Tanks" ["中国语言智库的国际传播能力建设"], webpage, October 20, 2022.

[382] Thorne, 2022b.

[383] For one research article on this topic that included interviews of China Global Television Network employees, see Zhouran Li and Gavin Xu, "Despite High Ambition, China's Media Influence Operation Is Far from Successful," *The Diplomat*, May 28, 2022.

[384] Shi Xiaojin [史小今], "Analysis of New Paths for Localized International Communications Capacity Building" ["地方国际传播能力建设新路径探析"], *International Communications* [对外传播], 2022.

[385] Zhou Fangyin [周方银], "Research Developing a Precise Communications Strategy for Southeast Asia Under in the New Era" ["新形势下对东南亚精准传播策略研究"], *International Communications* [对外传播], 2022.

portraying them as "overly self-serious, relatively simplistic in composition, repetitive, and lacking in artistic vividness."[386]

Third, there is an insufficient capability to evaluate the effectiveness of messaging and adapt it according to circumstances. PRC institutions tasked with undertaking strategic communications often lack effective standard operating procedures for evaluating the effectiveness of their messaging efforts.[387] This phenomenon is a result of a variety of factors, such as budgetary constraints, institutional calcification, and lack of internal subject-matter experts.[388] This lack of an institutional feedback loop is commonly cited as being a factor in preventing PRC influence outlets from learning from past mistakes and from developing long-term localized messaging strategies.[389] Additionally, these Chinese Party-state-affiliated researchers regard the metrics used as being archaic or unrepresentative. For instance, many PRC state media outlets assess the performance of their online outreach efforts using the metric of "aggregate engagement" (e.g., the number of impressions, likes, reposts, or comments that their posts generate).[390] Overreliance on these indicators is cited as being a key factor undermining PRC efforts to assess the impact of their external messaging and to correct course accordingly.[391]

These issues appear to be particularly pronounced within the PLA, which suffers from a high rate of workforce attrition among technical specialists due to such factors such as competition with the private sector.[392] First, PLA researchers, such as PLA NUDT's Liang Xiaobo, constantly criticize the lack of foreign language skills and cross-cultural understanding necessary for successful foreign influence operations.[393] Second, there is also concern about the poor quality of PLA propaganda, in part stemming from the first issue. Third and relatedly, PLA researchers often complain about lacking the necessary human capital to effectively conduct IOs in an ever-evolving global media environment.[394]

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[386] Ye Shulan [叶淑兰], 2021.

[387] "2019 Media Transformation and Development in the Artificial Intelligence Era Research Report" ["2019 年度人工智能时代媒体变革与发展"研究报告"], Xinhua [新华], 2019.

[388] "2019 Media Transformation and Development . . . , 2019.

[389] "2019 Media Transformation and Development . . . , 2019.

[390] "2019 Media Transformation and Development . . . , 2019.

[391] "2019 Media Transformation and Development . . . , 2019.

[392] Joe McReynolds and LeighAnn Luce, "China's Human Capital Ecosystem for Network Warfare," in Kamphausen, 2021.

[393] For more on this see Li Hongqian [李洪乾] and Liang Xiaobo [梁晓波], "The Problems of China's Defense Language Education Program and Their Countermeasures" ["语言战略化背景下的我国国防语言教育现状及策略研究"], *Journal of Yunmeng* [云梦学刊], Vol. 39, No. 2, 2018; Liang Xiaobo [梁晓波], "Cognitive Intelligence Language Weapon" ["认知智能语言武器"], *PLA Daily*, December 20, 2019. For analysis, see Beauchamp-Mustafaga, 2023a.

[394] See, for example, Zhang Wei [张伟], Tang Xiaoyan [汤晓燕], Chen Xi [陈曦], 2019.

Public Opinion Warfare as a Joint PLA Capability

An April 2017 article by Li Bicheng provides insights into how PLA IO researchers likely view their role in broader PLA operations.[395] Li begins by accepting formal PLA strategy that "integrated joint operations will become the main form of future informatized war" and are "based on an integrated operational system and rely on seamless network information systems."[396] The problem Li is trying to address is that "singular information domain online public opinion monitoring and guidance does not suit the overall integrated joint operation needs of online public opinion struggle."[397] That is, public opinion warfare should not be shunted into a backwater of PLA operations but, instead, should be treated as an integral part. This argument very likely reflects PLA IO community angst that they are not considered a core part of PLA warfighting and, thus, receive, at best, second-tier treatment compared with PLA kinetic capabilities, such as perhaps PLAN aircraft carriers, PLAAF fighters, and PLARF missiles. This is as much a bureaucratic argument as it is an argument about strategy and tactics.[398]

Li makes an impassioned case for public opinion warfare being part of PLA joint operations in light of its cross-domain nature, diverse participants, diverse capabilities involved, and diverse actions. First, in Li's view, leveraging the "Party, government, military and people" requires whole-of-government coordination and should be "integrated with [activities in the] political, economic, diplomatic, and military [domains], among others."[399] Second, it requires leveraging "real-time, integrated operational command" of multiple capabilities: "intelligence and reconnaissance, early warning detection, information transmission, information processing, attack/defense, efficiency evaluation, as well as command and control."[400] Third, it involves integrating multiple actions, including "monitoring and guidance, online information delivery, online protection and information blocking, and efficiency evaluation."[401]

Li argues that public opinion warfare possesses "integrated joint operation characteristics" because it requires the "integration of the physical, information, cognitive, and societal domains."[402] Because the physical domain is "where combat effectiveness takes place, where

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[395] Li Bicheng [李弼程], 2017.

[396] "With the Approval of the Chairman of the Central Military Commission Xi Jinping, the Central Military Commission Issued the 'Chinese People's Liberation Army Joint Operations Outline (Trial)'" ["经中央军委主席习近平批准 中央军委印发'中国人民解放军联合作战纲要 (试行)'"], Xinhua, November 13, 2020. For analysis, see David M. Finkelstein, *The PLA's New Joint Doctrine The Capstone of the New Era Operations Regulations System*, CNA Corporation, September 2021.

[397] Li Bicheng [李弼程], 2017.

[398] For more on this perspective, see Beauchamp-Mustafaga, 2023a.

[399] Li Bicheng [李弼程], 2017.

[400] Li Bicheng [李弼程], 2017.

[401] Li Bicheng [李弼程], 2017.

[402] Li Bicheng [李弼程], 2017.

infrastructure and information systems exist," network infrastructure and information systems serve as the "physical carriers of online public opinion."[403] Because the "information domain is where information is generated, controlled, shared, and spread," "news, blogs, forums, Weibo, WeChat, podcasts, Twitter, and Facebook" serve as the "information carriers of public opinion."[404] Because the cognitive domain is where "sensation, cognition, beliefs, and values exist, where decisions are made based on logical thought," public opinion involves the cognitive domains; "netizens are the owners of the internet and are the main pillars of online public opinion" and are "real people in society possessing thoughts, logic, and cognition, so whatever kind of netizens you have, you will have the same kind of online public opinion and online culture."[405] Because the societal domain is where "individuals, organizations, practical activities, and cultural blending exist," public opinion involves the societal domain and "international and domestic social environment are the objects of online public opinion"; thus, "changes in the environment have critical impact on the formation of online public opinion."[406]

In light of this, Li argues public opinion warfare should be viewed as joint operations and makes several recommendations. Specifically, first, the PLA should rethink how it integrates all domains into public opinion warfare and develop an "overall integrated joint operational command system" with "smooth top-to-bottom flow, unified command, and pluralistic force composition." Second, the PLA should develop joint capabilities, such as "integrated joint situational awareness technology and equipment, integrated joint attack/protection technology and equipment, and integrated joint decision support and operation command platforms." Finally, Li calls on the PLA to develop an "an overall integrated joint operation information network" that would include "all operational units, personnel, organizations, resources, weapons and equipment, [and] platforms."

The 2017 Li article appears to be an argument for better recognition of public opinion warfare in PLA operations, suggesting that Li then believed that the capability was underappreciated by broader and perhaps senior PLA decisionmakers. This aligns with longstanding concerns and similar arguments by the PLA psychological warfare community that they are overlooked, or worse, marginalized and even excluded from the PLA's operations because IO does not neatly fit into the PLA's system-of-systems approach to modern warfare.[407] Li's 2016 article makes this system-of-systems point quite clearly: "An important operational mode in the information era, online public opinion struggle is an organic part of the information

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[403] Li Bicheng [李弼程], 2017.

[404] Li Bicheng [李弼程], 2017.

[405] Li Bicheng [李弼程], 2017.

[406] Li Bicheng [李弼程], 2017.

[407] Beauchamp-Mustafaga, 2023a. See also Jeffrey Engstrom, *Systems Confrontation and System Destruction Warfare: How the Chinese People's Liberation Army Seeks to Wage Modern Warfare*, RAND Corporation, RR-1708-OSD, 2018.

system for system-of-system operations."[408] In some ways, Li also seems to mirror the broader PLA's kinetic focus, as he references content as "ammunition" [弹药] and also refers to "online public opinion weapons" [网络舆论斗争武器]—this is common among the PLA IO researcher community.[409] Moreover, Li's 2017 article also argues that online public opinion struggle is "gradually becoming" a more "normal operational measure and pattern."[410] This suggests that, after more than a decade of PLA discussions about the Three Warfares, they were (as of 2017) still not truly considered a normal PLA operation. While the PLA reforms under Xi were supposed to fix this, in part with the creation of the SSF as a strategic force to integrate IOs with cyber capabilities for strategic effect, this is certainly something to watch.

Making Military-Civil Fusion Work for Public Opinion Warfare

Li's research is a good microcosm of how broader PLA military-civil fusion efforts support public opinion warfare in theory and practice.[411] Li's 2017 article calls for considering online public opinion struggle to be a form of "people's war" and, thus, argues "it must fully combine the force of the Party, government, military and people, domestic and international forces, and online and offline forces."[412] This aligns quite well with the 2013 AMS version of *Science of Military Strategy* framing of psychological warfare as a whole-of-government effort.[413] The challenge, as Li notes, is that this has long been the plan but to middling (as of 2017) results:

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[408] Li Bicheng [李弼程], 2016.

[409] Li Bicheng [李弼程], 2016. For other recent examples, see Liu Jifeng [刘戟锋], Lu Xiao [卢潇], and Liu Yangyue [刘杨钺], "Technological Support for Strategic Psychological Warfare" [战略心理战的技术支撑], *National Defense* [国防], February 2017; Sun Yixiang [孙亦祥] and Yu Yuanlai [余远来], 2022; Sun Yixiang [孙亦祥] and Liu Boda [刘博达], "'Four in One': Exploring the Way to Win in Public Opinion Struggles: Thoughts on Improving the Quality and Effectiveness of Public Opinion Struggles in the All-Media Era" ["'四位一体': 探究舆论斗争的制胜之道: 提高全媒体时代舆论斗争质效的思考"], *Military Correspondent* [军事记者], March 2023; Yu Yuanlai [余远来] and Mo Yifei [莫一斐], "Take the Initiative: Seize the Commanding Heights of the International Public Opinion Struggle: Thoughts on Fighting the International Public Opinion War Against the US Hyping Up Issues Involving Our Military" ["主动作为: 抢占国际舆论斗争制高点: 打好反制美炒作涉我军议题的国际舆论战的思考"], *Military Correspondent* [军事记者], May 2023.

[410] Li Bicheng [李弼程], 2017.

[411] For a good overview, see Stone and Wood, 2020.

[412] Li Bicheng [李弼程], 2017.

[413] Academy of Military Science, Military Strategy Department [军事学学院战略研究部], *Science of Military Strategy* [战略学], 3rd ed., Military Science Press [军事科学出版社], 2013. For two PLA articles on military-civil fusion for psychological warfare, see Yang Yunxue [杨运学] and Wei Yukuan [魏玉宽], "Take a New Path of Military-Civil Fusion for Psychological Warfare" ["走开心理战军民融合式发展的新路子"], *Journal of Xi'an Politics Institute of PLA* [西安政治学院学报], Vol. 27, No. 3, June 2014; Ding Cheng [丁成], Li Xiaoyan [李晓燕], and Cao Guanping [曹冠平], "How to Take Advantage of Military-Civil Fusion Development Opportunities to Do a Good Job in the Construction of Psychological Warfare in Reserve Forces" ["如何利用军民融合式发展机遇抓好预备役部队心理战建设"], *Intelligence* [才智], 2015.

> The Chinese government, institutions, military, enterprises, and industries are all highly interested in online public opinion monitoring and guidance and have developed many online public opinion monitoring and guidance systems and invested large amounts of human, physical, and financial capital with definite results. However, this has not achieved the expected results.[414]

In some ways, Li epitomizes this military-civil fusion approach. For example, Li's shift to Huaqiao University under the UFWD very likely helped the PLA better connect with other parts of the Party-state working toward similar objectives. Even more, Li's partnership with Meiya Pico represents one likely successful effort to bring outside resources into PLA-affiliated research.

One Chinese private-sector company that claims to support the PLA for social media–related work is the Word Emotion Internet Intelligence Research Institute [沃民高科沃德网情研究]. This research organization has been involved in several high-profile news stories over the years, including compiling a leaked report on Chinese domestic reaction to the death of COVID-19 whistleblower Dr. Li Wenliang, and telling the *Washington Post* that the company was monitoring the 2020 U.S. election for its clients.[415] The company's website acknowledges work for the military, and Chinese official media list the chief executive officer, Qi Zhongxiang, as vice chairman and spokesperson for a military-civil fusion organization, the Military-Civil Fusion Industry Technology Innovation Strategic Alliance. At a July 2017 meeting of the organization, Qi presented a report titled "Military-Civil Fusion from the Perspective of Internet Big Data."[416] During a January 2019 visit to the company by a Chinese government delegation, a PLA NDU professor said that the company's

> emotion recognition algorithm is very distinctive . . . especially [that it can provide] comprehensive analysis of emotions. It has ability to [conduct] intelligent early warning of risky events [instability . . . .] It is very innovative and necessary to promote and use it for social governance.[417]

Other Chinese companies have also been suggested as supporting Chinese government efforts.[418] For example, an August 2020 report suggested that Knowlesys, Yunrun Big Data Service, and OneSight support Chinese government monitoring of overseas social media

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[414] Li Bicheng [李弼程], 2017.

[415] The company's public-facing platform is called Wordemotion [沃德社会气象台). See Gerry Shih, "As Anger Explodes Over Doctor's Death, Beijing Firm Gives Chinese Government Advice," *Washington Post*, February 8, 2020a. A translation is available: Josh Rudolph, "Translation: Recommendations for Handling Netizen Reaction to Li Wenliang's Death," *China Digital Times*, February 7, 2020.

[416] "Military-Civil Fusion Industry Technology Innovation Strategic Alliance Launched in Beijing" ["军民融合产业技术创新战略联盟在京启动"], Xinhua, July 10, 2017.

[417] "Womin Hi-Tech Became One of the Stops of the 'National Data Governance' Investigation" ["沃民高科成为'国家数据治理'考察的其中一站"], *Southern China Public Opinion* [中南舆情], August 21, 2020.

[418] Chandra and Navarre Chao, 2023.

platforms.[419] More recently, in May 2023, Meta named several Chinese companies, including Xi'an Tianwendian Network Technology, as supporting disinformation operations that Meta has removed from its platform.[420] Other Chinese companies, such as Intelligent Cognition of the Future (Chengdu) Technology Co., openly pitch their services in Chinese military journals.[421] These Western reports do not specify which part of the Chinese government the companies were supposedly working for, but these types of companies are increasingly likely to be connected to Chinese government and military organizations. This, in many ways, should be unsurprising; Chinese companies have been motivated, in part, to sell products to foreign customers via Western social media, creating an ecosystem of other Chinese private companies that have learned to navigate foreign social media platforms for these customers—marketing and propaganda are not very different in this sense.[422]

This aligns with broader PLA interest in military-civil fusion. To improve its ability to undertake public opinion struggle, the PLA has drawn extensively on the expertise and technical acumen of civilian institutions in the PRC under the aegis of military-civil fusion. This appears to have really become a focus of the PLA around 2014, when military-civil fusion was enshrined as a national strategy, leading to an uptick in PLA research on applying military-civil fusion to public opinion warfare (among many other topics). Yet more institutional approaches appear to have taken shape several years later, around 2016 or 2017. At a July 2016 PLA conference addressing Xi's call earlier that year for better public opinion guidance, part of the discussion centered on military-civil fusion.[423] Specifically, a *PLA Daily* article summarizing the conference stated that conference participants,

> emphasized the need to thoroughly implement the strategic thinking of military-civil fusion and further strengthen cooperation with local networks. We should strengthen communication and cooperation between information departments and online media, improve and innovate military-civil collaboration mechanisms, and work together to build a clear and clear cyberspace.[424]

[419] Lorenzo Franceschi-Bicchierai, "Hackers Leak Alleged Internal Files of Chinese Social Media Monitoring Firms," *Vice*, August 21, 2020.

[420] Meta, *Quarterly Adversarial Threat Report*, May 2023.

[421] He Yu [何宇] and Zhang Hua [张化], 2023.

[422] Paul Mozur and Lin Qiqing, "How Facebook's Tiny China Sales Floor Helps Generate Big Ad Money," *New York Times*, February 7, 2019.

[423] Kuang Dazhen [匡大镇] and Hong Wenjun [洪文军], 2016.

[424] Kuang Dazhen [匡大镇] and Hong Wenjun [洪文军], 2016.

Similarly, at the first China Military Online Media Summit Forum [中国军事网络媒体高峰论坛] in November 2017, a deputy director of the PLA CMC's Political Work Department also endorsed military-civil fusion for propaganda.[425]

A 2010 article was perhaps the most specific in how at least one PLA NUDT researcher considered this would work in practice, although it is quite possible that the material is now out of date.[426] The article argued that the PLA needed to "establish a formal online public opinion warfare unit" [舆论作战力量], which would have different tasks in peacetime and in wartime. In peacetime, it would "mainly be engaged in online public opinion monitoring and control [网络舆情监控] and foreign propaganda [对外宣传]."[427] In wartime, it would transition to focus on "coordinating and commanding online public opinion attack and defense" [网络舆论攻防].[428] Turning to military-civil fusion, the author argued for "integrating civilian online public opinion resources [民间网络舆论资源], supporting the development of military online media, building a group of full-time backbone management teams, and using online forums as a link to unite the majority of netizens."[429] The article specifically seeks to identify different groups that align closely with the IO process as conceptualized by Li Bicheng and other PLA researchers. It lists "information collection and compilation groups [信息收集整理人群], analysis and production groups [分析制作人群], delivery and attack groups [发送攻击人群], feedback evaluation groups [反馈评估人群], and technology and support groups [技术保障人群]."[430] The article also references a "shock force" [奇兵], seemingly like a reserve or militia force, that can " take on missions that are inconvenient or difficult for the 'regular military' [正规军] to complete independently."[431] Finally, the article calls for "focusing on uniting overseas expatriates or

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[425] "Yu Guang, Deputy Director of the Political Work Department of the Military Commission: Work together to create a clearer online public opinion space" ["军委政治工作部副主任禹光：携手打造更加清朗的网络舆论空间"], China Military Online, November 24, 2017.

[426] Liang Wei [梁卫], 2010.

[427] Liang Wei [梁卫], 2010.

[428] Liang Wei [梁卫], 2010.

[429] Liang Wei [梁卫], 2010.

[430] Liang Wei [梁卫], 2010.

[431] Liang Wei [梁卫], 2010. There is little known about public opinion warfare reserve or militia forces, but there are some known references these for psychological warfare. For psychological warfare reserve forces, see Yang Guoping [杨国平], Luo Anmao [罗安茂], and Yin Yanxin [尹延欣], "The Psychological Warfare Reserve Forces Should Be Studying" [预 备役部队要研究的心理战], *Southwest Militia* [西南民兵], February 2007; Li Xiaoguang [李小光] and Zhou Shaozhen [周守珍], "Analysis on the Operational Mechanism of Psychological Warfare in Reserve Forces" [预备役 部队心理战运行机制探析], South China National Defense Medical Journal [华南国防医学杂志], Vol. 28, No. 5, 2014. For militias, see Devin Thorne, *Inside China's National Defense Mobilization Reform: Capacity Surveys, Mobilization Resources, and "New-Type" Militias*, Recorded Future, March 2022a.

foreign people and organizations that support [our] just war, so that they can become an effective force for propaganda against the enemy [对敌宣传] and drive defections [策反]."[432]

A main theme in PLA discussions about military-civil fusion has been on leveraging other Party organizations. Public opinion work is seen as a natural point for collaboration between the PLA and its civilian counterparts, given that operations in that domain primarily take place in nonmilitary venues, such as social media and internet forums. This concept is summarized in a 2019 article published by authors affiliated with the PLA's Eastern Theater Command Political Work Department [东部战区政治工作部] that outlines the relationship between "military struggle" [军事斗争] and news and propaganda work [新闻宣传] under modern conditions.[433] It notes that "in the long practice of revolutionary struggle, public opinion and propaganda [work] is a unique political advantage of our Party and military that we have a rich experience in employing.[434] The article went on to elaborate that, to adapt to changing conditions, the PLA must "cultivate talent teams with international perspectives" and "incorporate local advanced scientific and technological achievements to serve operations."[435]

These efforts appear to have taken off in the mid-2010s. Multiple PLA articles in 2014 considered how to leverage local Party organs, including their own foreign propaganda capabilities, to support PLA efforts.[436] As a 2014 article by Base 311 researchers considering how to "safeguard" China's "space interests" through public opinion warfare argued, military-civil fusion should be especially focused on "foreign propaganda media resources" [外宣媒体资源].[437] Accordingly, throughout the 2010s, the PLA appears to have made significant strides in establishing stronger linkages with provincial and local governments, another unexplored group of Chinese Party-state-affiliated actors for social media manipulation, to build its capacity to shape foreign public opinion. Another PLA application of the military-civil fusion concept to

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[432] Liang Wei [梁卫], 2010.

[433] Zhang Wei [张伟], Tang Xiaoyan [汤晓燕], Chen Xi [陈曦], 2019.

[434] Zhang Wei [张伟], Tang Xiaoyan [汤晓燕], Chen Xi [陈曦], 2019.

[435] Zhang Wei [张伟], Tang Xiaoyan [汤晓燕], Chen Xi [陈曦], 2019.

[436] For some, see Jin Weihua [金卫华], "Focus on Winning the War and Giving Full Play to the Lifeline Role of Political Work" ["聚焦能打胜仗充分发挥政治工作生命线作用"], *Theoretical Studies on PLA Political Work* [军队政工理论研究], Vol. 15, No. 2, April 2014; Wu Qiong [吴穹] and Ma Yongfu [马永富], "Focusing on the Needs of Joint Operations and Strengthening the Training of 'Media Traders' in Our Military Officers and Soldiers" ["着眼联合作战需求加强我军官兵'媒商'培养"], *Theoretical Studies on PLA Political Work* [军队政工理论研究], Vol. 15, No. 2, April 2014.

[437] Zeng Lian [曾率], Wu Gang [吴刚], and Jiang Bo [姜波], "A Preliminary Study on the Application of Public Opinion Warfare to Safeguard [Our] Country's Space Interests" ["维护我国太空利益舆论战运用初探"], *Journal of Xi'an Politics Institute* [西安政治学院学报], Vol. 27, No. 3, June 2014.

social media in the mid-2010s was to simply argue that the PLA should embrace social media as a vector for its IO by opening accounts.[438]

Such PLA discussions have continued into the 2020s, with little apparent evolution despite an apparent shift in practice. Most PLA writings are still rather generic and focused on leveraging civil Party organs' foreign propaganda capacities, and similar discussions for CDO have also shown little change in substance.[439] For example, one 2022 article by a PLA researcher called for building a "social media information warfare force" [社交媒体信息战力量], but then simply said, in essence, that all parts of the Party-state should cooperate.[440] In contrast, there was little explicit discussion of leveraging civilian companies for data and social media operations, but this does indeed appear to be a trend that is likely the most beneficial to Beijing (and thus worrisome to Washington).

Interest in Cognitive Science

A February 2019 article Li coauthored reflects his interest in applying cognitive science to his work on online public opinion guidance, specifically to better understand how public opinion evolves online and thus how the CCP can better guide (control) it.[441] Li explains that the problem is that "existing research mostly proposes online public opinion monitoring and guidance strategies from a contingency management perspective but does not deeply explore the cognitive mechanism of online public opinion or the cognitive impact of online information on netizens." Thus, Li's research sets out to solve this problem by developing a model of "online public opinion dissemination" [网络舆情扩散传播] by "drawing from methods of analyzing excitation

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[438] Xu Yingxue [徐英雪] and Lan Fen [兰芬], 2014.

[439] For some recent references to military-civil fusion for public opinion warfare, see Li Xiubao [李秀宝], "Be a Pioneer in the In-Depth Development of Military Media Integration" ["做军事媒体融合向纵深发展的开拓者"], *Military Correspondent* [军事记者], March 2019; Editorial Department [本刊编辑部], "Provide Strong Public Opinion Support for Building a World-Class Military—Conscientiously Study, Publicize and Implement the Spirit of the 20th National Congress of the Party" ["为建成世界一流军队提供有力舆论支持: 认真学习宣传贯彻党的二十大精神"], *Military Correspondent* [军事记者], June 2022; Liu Yong [刘永], 2022. For some recent references for CDO, see Luo Yuzhen [罗语嫣], Li Wei [李璜], Wang Ruifa [王瑞发], Lei Wei [雷潇], Liao Dongsheng [廖东升], and Zhu Yingying [朱莹莹], "Characteristics and Key Technologies of the Common Domain for the Cognitive Domain" [认知域的公域特性及其关键技术], *National Defense Technology* [国防科技], April 2018; Liu Huiyan [刘惠燕] et al., 2018; Liang Xiaobo [梁晓波], "Cognitive Domain Operations Are the New Main Battlefield of Language Confrontation" ["认知域作战是语言对抗新的主战场"], China Social Sciences Network [中国社会科学网], May 17, 2022.

[440] Liu Yong [刘永], 2022.

[441] Li Bicheng [李弼程] and Guo Lei [郭磊], "Cognitive Mechanism Analysis of Online Public Opinion" ["网络舆情认知机理分析"], *National Defense Technology* [国防科技], Vol. 40, No. 1, February 2019. This research by Li draws in part on Wang Chunshi [王春诗], *Research on the Cognitive Model of Online Public Opinion of Emergencies Based on Brain Psychological Mechanism* [基于脑心理机制的突发事件网络舆情认知模式研究], Fudan University, 2011.

and systems within signals and systems to combine complex network theories" to "more effectively conduct online public opinion analysis, guidance, and control."[442] The research is intended to be

> helpful for producing online public opinion guidance countermeasures [网络舆情引导对策], which include online public opinion publishing time [发布时间], publishing methods [发布方式], guidance strategy generation [引导策略生成], and disposal methods [处置方式].[443]

Li's discussion of the "online public opinion cognitive mechanism" [网络舆情认知机理], defined as "the biological and psychological elements and their mechanisms of action within the online public opinion formation and development process."[444] This is important because it "decides the impact that online media information has on an individual or group, the information dissemination behavior of online media, and other factors." Li also adds that

> netizen psychology (including netizen blind obedience, identification with authority, preconceptions, and herd effect) can be used to produce online public opinion guidance countermeasures, which include individual breakdowns, topic differentiation, positive counterattacks, and opinion leaders.[445]

Table 6.1. Li Bicheng's Application of Brain Science to Information Processing

Region of the Brain	Function	Cognitive Influence
Cerebral cortex	Visual information	Pictures, alphanumerics
Visual cortex—fusiform gyrus	Auditory information	Sounds, alphanumerics
Auditory cortex—anterior superior temporal sulcus	Sensory information (cognition, attention)	Pictures, alphanumerics
Anterior cingulate cortex	Emotion, cognition, monitoring	Not applicable
Insular cortex	Aversion, addiction	Not applicable
Amygdala (left, right)	Emotions (anger, fear, aggression)	Pictures
Hippocampus (left, right)	Emotion, memory storage and retention	Pictures
Thalamus	Sensory information transmission	Pictures

SOURCE: Drawn from Wang Chunshi [王春诗], 2011, via Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.
NOTE: Reproduced from Beauchamp-Mustafaga, 2023a.

Li concludes that, based on his review of cognitive science, the CCP should prioritize visual content over other forms of media. As Li explains, "visual information has the largest stimulation effect on the brain because it can stimulate regions including the visual cortex, association

[442] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

[443] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

[444] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

[445] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

cortices, amygdala, hippocampus, and thalamus."[446] Other sensory inputs are less effective because, "compared with visual information, textual, numerical, and auditory information takes effect slower."[447] This is primarily because "this information does not stimulate the amygdala directly but rather produces impact through the transmission of stimulation from different cortical areas."[448] Li draws practical recommendations—"for example, people's ability to remember visual information is very strong, so visual information should be adopted in online public opinion struggle to strengthen results and deepen impact."[449] Similarly, "in terms of sound, the female voice stimulates more parts of the brain than the male voice, making female announcers [播音员] more stimulating than male announcers. Therefore, adopting female announcers strengthens results."[450] However, recent reports of PRC use of AI-generated voiceovers for propaganda videos featured as least some male announcers.[451] Li appears to continue working on this line of research, as he cofiled a patent in May 2024 that claims to conduct a "cognitive vulnerability analysis" of social media users based on analysis of their social media posts.[452]

Li argues that "the internal drivers of online public opinion formation are embodied in the interests and psychological forces of the public, with interests being the drives of public opinion formation and netizen psychology controlling the formation and evolution of online public opinion."[453] External drivers, in turn, are "embodied in the effects of social environments and cyberspace."[454] For Li's approach using complex networks, netizens in this case "are viewed as complex network nodes, and information dissemination produced by online information contact between people is viewed as directed node connections in the network."[455]

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[446] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

[447] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

[448] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

[449] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

[450] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

[451] Jacinta Keast, *Shadow Play: A Pro-China Technology and Anti-US Influence Operation Thrives on YouTube*, Australian Strategic Policy Institute, December 2023.

[452] Li Bicheng [李弼程], Chen Zhibin [陈志彬], Kang Zhiyong [康智勇], Pi Huijuan [皮慧娟], Wang Huazhen [王华珍], and Wang Cheng [王成], "Social Network User Cognitive Vulnerability Analysis Method and Device Based on Fuzzy Comprehensive Judgment Technology" ["基于模糊综合评判技术的社交网络用户认知脆弱性分析方法及装置"], Chinese patent number CN118536610A, filed May 23, 2024.

[453] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

[454] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

[455] Li Bicheng [李弼程] and Guo Lei [郭磊], 2019.

Conclusion

Li's prolific research output provides valuable insights into other facets of the PLA's thinking on social media manipulation and broader cyber-enabled influence operations. Although Li's writings alone are not definitely authoritative, they often align with broader PLA trends and, thus are, at minimum, a useful open-source case study for better understanding this underappreciated aspect of PLA strategy and operations.

The next chapter puts Li's research in the broader context of other PLA and Chinese Party-state researchers.

Chapter 7. Putting Li Bicheng's Research into Context

Given this report's focus on Li Bicheng as a case study, it is also useful to place his research into the broader context of PLA and other Chinese Party-state efforts to engage in social media manipulation. This chapter explores other PLA thinking and, when available, that of the broader Party-state, specifically on adopting social bots, which are the crux of Li's vision of large-scale AI-driven IO. We have found that Li's research is indeed cutting edge relative to the general trendline of interest by other PLA thinkers, leading by at least a couple years and also moving closer toward operationalization.

We identified three articles by PLA researchers other than Li that explicitly call for adoption of social bots, and another four articles implicitly but clearly making this case (three by PLA researchers and one by MFA researchers). There is a clear evolution from (1) initially treating social bots as an inconvenient and even annoying distraction from Chinese propaganda, to (2) a strong fear of the potential threat of social bots run by foreign governments (especially that of the United States) to undermine the CCP regime, to (3) recognizing the offensive potential of social bots to artificially influence foreign (and probably domestic) public opinion. While Li was already talking about leveraging social bots by 2019, others in the PLA came around to the idea in the early 2020s.

The PLA has long been interested in using the cover of inauthentic personas for influence operations, whether using nominally private companies and civilian organizations as cover for PLA foreign engagements or listing fake academic institutions as cover while studying abroad.[456] PLA researchers generally define *social bots* as automated inauthentic accounts on social media but rarely clearly acknowledge the inauthentic part. Social bots are, thus, distinct from the traditional human-run individual or large-scale efforts that China appears to have used earlier, based on PLA writings.[457] Social bots offer the PLA scale, which was previously constrained by the limited human capital with foreign language skills. Generative AI will likely offer a dramatic improvement for PLA social bots.

One taxonomy for social bots that some PLA researchers use differentiates the bots by their purpose.[458] A 2022 article identifies several different types of social bots: "malicious botnet bots" [恶意僵尸网络机器人], which are "controlled by remote network intrusion" [远程网络入侵操控]; "research bots" [调研机器人], which are responsible for crawling and analyzing data

[456] Stokes and Hsiao, 2013; Joske, 2018.

[457] For an early reference to sock puppets, see Ma Linli [马林立], *Foreign Military Cyberspace Warfare: Current Situation and Development* [外军网电空间战：现状与发展], National Defense Industry Press [国防工业出版社], 2012.

[458] Long Yameng [龙亚蒙] and Zhou Yang [周洋], 2022.

from the internet; "editing bots" [编辑机器人], which "use algorithms to automatically create data"; and "chatbots" [聊天机器人], which pretend to be online real people and respond to basic user requests.[459] Turning to more applied types, the authors explain there are three subtypes of "political bots" [政治机器人] that are specifically used in public opinion struggle: "propaganda bots" [宣传机器人], "follower bots" [跟随者机器人, sometimes also called 跟随机器人 or 关注机器人], and "roadblock bots" [路障机器人].[460] This specific categorization of social bots generally aligns with other PLA and broader Chinese descriptions of social bots.[461]

Early Awareness

In retrospect, some PLA researchers have looked back as far as 2011 for perhaps the first social bots that were reportedly pushing pro-Assad regime content on Twitter during the Syrian civil war.[462] The earliest known PLA discussions, however, came in 2015 from a Nanjing Political Institute researcher, Tang Tinging.[463] Tang's writings suggest social bots were initially considered a problem of distracting or otherwise overwhelming audiences that had to be overcome in CCP propaganda success, if they were a focus at all.[464]

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[459] Long Yameng [龙亚蒙] and Zhou Yang [周洋], 2022.

[460] MFA researchers also mentioned roadblock bots in 2019, noting the use of social bots in other countries. See Ou Ya [欧亚] and Xia Yue [夏玥], "Covert Persuasion: Computational Propaganda and Its Challenge to China's International Communication" ["隐蔽的说服: 计算式宣传及其对中国国际传播的挑战"], *International Communications* [对外传播], December 2019.

[461] The original source for this categorization may be Zhang Hongzhong [张洪忠], Zhao Bei [赵蓓], and Shi Weiying [石韦颖], "Behavioral Analysis of Social Bots Participating in the Sino-US Trade Negotiation Issues on Twitter" ["社交机器人在 Twitter 参与中美贸易谈判议题的行为分析"], *Journalism and Mass Communication Monthly* [新闻界], 2020. Zhou Yang also uses the same categorization in another article: Zhou Yang [周洋], "Grasping the Trend: Improving the Ability of Our Army to Accurately Disseminate Military Information, Research on the Accurate Dissemination of Military Information in the Era of Smart Media" ["把握趋势: 提升我军军事信息精准传播能力, 智媒时代军事信息的精准传播研究"], *Military Correspondent* [军事记者], February 2023. For other PLA uses, see Wang Yunlong [王云龙] and Zhang Zhiwei [张智伟], "Emerging Communication Technology Revolution and Developmental Trends in Military Struggle for Public Opinion" [新兴传播技术革命与军事舆论斗争发展趋势], *China Military Science* [中国军事科学], August 2020.

[462] Jillian York, "Syria's Twitter Spambots," *The Guardian*, April 21, 2011. For PLA articles on this, see Wang Jinxia [王金霞], "Emotional Computing: Achieving Intelligent Interaction Technology" ["情感计算: 成就智能交互技术"], *PLA Daily*, April 8, 2022; Long Yameng [龙亚蒙] and Zhou Yang [周洋], 2022.

[463] Tang Tingting [唐婷婷], "The Imbalance and Reconstruction of the 'Reflection Arc' Structure in the Era of Information Fragmentation" ["信息碎片时代 '反射弧' 结构的失衡与再造"], *Journalism & Communication* [新闻传播], February 2015; Tang Tingting [唐婷婷],"Fragmented Dissemination of Information in the Social Media Era" ["社交媒体时代信息的碎片化传播"], *Press Outpost* [新闻前哨], No. 5, 2015.

[464] For a similar perspective, see Stephen Chen, "China's Internet Police Losing Man-Versus-Machine Duel on Social Media," *South China Morning Post*, November 14, 2021.

A 2016 article by an AMS graduate student provides the first recognition of the problem for the PLA and China.[465] It claims that the United States "regards social media as the main tool for public opinion warfare," including creating a "special media force" [特种媒体部队] in 2006 and creating an "astroturf unit" [网络水军] in 2011, while also developing a "social media strategic communication plan" [社交媒体战略沟通计划]. The author claims this U.S. plan includes "mass-produced social network bots [社交网络机器人] releasing sensitive information [敏感信息] to 'explode online public opinion' [引爆网络舆情]" in part to "distort and slander [扭曲诋毁] the glorious history of our party and our army, spoof and bad-mouth [恶搞唱衰] red classics, and clamor to deny the nature of the army."[466] This reflects the broader threat perception of the PLA and concerns over CCP legitimacy and regime legitimacy.

A 2019 article coauthored by researchers from the PLA Army and Chinese Academy of Science Institute of Automation also highlighted how social bots were damaging China's international reputation and appears to blame Western social media companies instead of the U.S. government.[467] Describing the social media struggle surrounding the 2019 Hong Kong protests as "observational warfare" [观战], the authors acknowledged that Facebook and Twitter took down accounts, without mentioning that the accounts in question had been attributed to the Chinese government. The authors instead argued the accounts that had been taken down were "from the private sector" and that they "only published the truth about incidents, such as demonstrators attacking the police and beating reporters."[468] The authors then argued that "on the other hand, various 'zombie' bots [僵尸机器人] on the internet have spread a lot of disinformation, amplifying violent law enforcement by the Hong Kong government." It is unclear whether these researchers were unaware of Party-state efforts or were just deflecting and excusing CCP activities. Regardless, this shows that the issue of social bots as both a powerful capability in shaping social media discourse but also a threat specifically to the CCP and its desire to control public opinion, including on social media, has been gaining attention.

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[465] Zuo Hongbo [左红波], "The Impact and Countermeasures of Social Media on Our Military's Ideological Work" ["社交媒体对我军意识形态工作的影响与对策"], *Journal of Political Work* [政工学刊], No. 2, 2016.

[466] Zuo Hongbo [左红波], 2016. Zuo Claims the U.S. communication plan is also known as the also known as the "social network bomb" [社交网络炸弹].

[467] Li Qiang [李强] and Wang Feiyue [王飞跃], "A Framework and Key Issues of Parallel Social Warfare Systems for Contemporary Mixed Wars and Military Operations Other Than Wars" ["'三战合一'下的平行智能'观战'系统架构及核心关键技术研究"], *Military Operations Research and Systems Engineering* [军事运筹与系统工程], Vol. 33, No. 4, 2019. The lead author makes a very similar argument in a 2021 article: Li Qiang [李强], Yang Dongsheng [阳东升], and Sun Jiangsheng [孙江生], "Social Cognition Operations: Backgrounds, Concepts, Mechanisms and Leading Technologies" ["社会认知战: 时代背景, 概念机理及引领性技术"], *Journal of Command and Control* [指挥与控制学报], 2021.

[468] Li Qiang [李强] and Wang Feiyue [王飞跃], 2019.

Calls for Going on the Offensive

While Li Bicheng was already calling for China to adopt his version of social bots by 2019, other PLA researchers belatedly came to the same realization in the early 2020s. Some have been equally as explicit as Li, although more have strongly implied that they support China's adopting similar tactics. Of note, several PLA researchers have framed this under the broader PLA strategy of "active defense" [积极防御], which justifies preemptive offensive action under the guise that the adversary has already decided to oppose you.[469] This PLA interest in social bots marks a likely change from the PLA's apparent traditional use of human-run fake accounts on social media.[470]

This is not to say that PLA researchers view social bots solely as a capability to target adversary societies. They also identify social bots as useful for other purposes, such as a 2022 article that called for using them to rally PLA troops' fighting spirit through internally focused propaganda.[471] This is very likely in response to longstanding PLA concerns over the psychological readiness of its troops for war and interest in leveraging emerging technology to improve PLA's indoctrination of and emotional support for its troops.[472]

Explicit Calls

One explicit argument justifying tit-for-tat retaliation was a 2022 article by two researchers at PLA NDU, which argued that "in the face of Western countries taking the opportunity to smear and attack [us], we must have the courage to use social bots [社交机器人] to carry out public opinion [struggle . . .] and use relevant social bots to carry out information bombing [信息轰炸] against the enemy's social network to drown it out [遮掩效应]."[473] One of the authors, Zhou Yang, used the exact same line in a 2023 article, with more details about how to manipulate social media:

> We must have the courage to use social bots [社交机器人] to carry out public opinion [struggle . . .] [we should] guide the direction of public opinion by activating and amplifying 'anthropomorphic' [拟人化] public opinion leader

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[469] See, for example, Ma Lu [马璐], 2022; Zhou Yang [周洋], 2023. For a discussion of active defense, see Taylor Fravel, *Active Defense: China's Military Strategy Since 1949*, Princeton University Press, 2019.

[470] For one example of this discussion, see Luo Yuan [罗援], 2016.

[471] Li Manxiang [李满想], "Analysis on Inspiring the Fighting Spirit of Our Army from the Perspective of Intelligence" ["智能化视域下我军战斗精神激发探析"], *Journal of Political Work* [政工学刊], No. 2, February 2022. The article also touts the benefits of deepfakes for propaganda, specifically making deepfakes of adversary commanders.

[472] Beauchamp-Mustafaga, 2023a. See also Ryan Martinson, "The Courage to Fight and Win: The PLA Cultivates Xuexing for the Wars of the Future," *China Brief*, June 1, 2016.

[473] Long Yameng [龙亚蒙] and Zhou Yang [周洋], 2022.

> social bots [舆论领袖社交机器人], and at the same time use propaganda bots, follower bots and roadblock bots.[474]

In 2022, he added,

> on the basis of cracking the enemy's ability to verify the account information for social bots, the social bot will complete public opinion struggle and intelligence collection tasks, such as predicting the attributes of artificial users, analyzing their social behavior network, destroying the enemy's opinion leaders [摧毁敌意见领袖], speeding up the dissemination of the enemy's redundant content [冗余内容], burying its effective information, comprehensively disrupting the enemy's information order [信息秩序], intensifying its internal contradictions [内部矛盾], and causing a strong large-scale effect [强大规模效应].[475]

Clearly, Zhou is not shy about stating the true purpose of this PLA interest in social bots.

Long and Zhou focus on the immense capabilities offered by social bots.[476] They point to the combination of advanced computing—"big data, cloud computing, and deep-learning technology"—plus the internet, which has made social bots have a "profound impact on national security, regime stability [政权稳定], and military and political propaganda [军事政治宣传]." This includes the "invisible manipulation of audiences," such as

> disseminating a large amount of misleading or politically inclined information through targeted dissemination [定向传播]; constantly agitating and provoking public opinion on socially sensitive issues, such as race and national security; arousing emotional resonance, thereby manipulating public opinion; weakening the dominant force of mainstream ideology; and reducing public political identity.

Turning to applications, the authors explain that there are three main uses of social bots: political interference [政治干扰], counterterrorism, and supporting military operations. The authors argue that many countries are using social bots to undermine adversary governments, from Russia's use of bots against the United States in 2020 to unnamed attacks on Poland. Long and Zhou appear concerned that this proliferation of social bots allows almost anyone to undermine governments, perhaps reflecting some Chinese concern about countries beyond the United States: "Medium-sized countries and even small countries [can] launch public opinion wars and instigate 'color revolutions' [颜色革命]." The authors describe Russia's efforts against the United States as follows:

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[474] Zhou Yang [周洋], 2023.

[475] Long Yameng [龙亚蒙] and Zhou Yang [周洋], 2022. For a similar argument in 2023, see Zhou Yang [周洋], 2023. Zhou adds "we must use specific events to trigger resonance and create a strong large-scale effect, so as to seize the initiative in the struggle for public opinion" [借助特定事件引发共鸣, 造成强大规模效应, 从而占据舆论斗争先机].

[476] Long Yameng [龙亚蒙] and Zhou Yang [周洋], 2022.

> Russia created false online personalities [创建虚假网络人物] on social media, built and deployed a 'troll army' [巨魔大军] with a large number of social bots, and used the 'troll farm' [巨魔农场] group operation to collect information and spread rumors [散布谣言], exacerbating existing problems in the United States, and then affecting the U.S. presidential election [影响美国总统选举].[477]

The authors' interest in leveraging social media for counterterrorism and supporting military operations follows preexisting PLA IO strategy.[478]

Another 2023 article also explicitly calls for the PLA to adopt social bots.[479] While the article is by an NUDT graduate student, it acknowledges using funding from NUDT professor and PLA IO expert Liang Xiaobo's 2016 grant from the NSSF on "Research on the Construction of National Defense Language Capacity in the Context of National Defense and Military Reform" [国防和军队改革视野下的国防语言能力建设研究], which focused on supporting the PLA's development of foreign language capabilities.[480] This article and other related research suggest that at least part of the true intent for the project was to support PLA foreign influence operations.[481]

The 2023 NUDT article paints a high capability and dark threat from social bots. It describes them as "a weaponized cognitive manipulation tool [武器化的认知操控工具] to trigger a transformative war of public opinion" and argues that they "may cause a series of political, social, moral and legal risks" and, even worse, might be used by "certain countries and organizations to hijack public opinion [挟持舆论], consolidate their hegemony [巩固霸权], conduct cultural and ideological infiltration [文化和意识形态渗透], and plan 'information colonization' [信息殖民]."[482] In response, the article calls for the PLA to better defend against social bots but then also to leverage AI to run botnets. Specifically, the author calls for "learning to use code to produce and disseminate narratives, and use intelligent tools to promote the leap in public opinion warfare capabilities in the intelligent era," as well as to develop

> cognitive frameworks [认知框架], cognitive prototypes [认知原型], and cognitive metaphor scripts [认知隐喻脚本] that are commensurate with our country's needs for conducting public opinion struggles and to give play to our

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[477] The authors cited unnamed RAND research on Russian efforts for this.

[478] Beauchamp-Mustafaga and Chase, 2019.

[479] Wu Xiaojian [武啸剑], "How Social Bots Manipulate Public Opinion in the Age of Intelligent Communication: An Analysis of Narrative and Cognition Under Crisis" ["危机下的叙事与认知: 智能传播时代社交机器人舆论干预研究"], *Journalism and Mass Communication* [新闻界], September 2023.

[480] The grant number is 16ZDA210.

[481] For more on this grant, see Beauchamp-Mustafaga, 2023a; Beauchamp-Mustafaga and Smith, 2024.

[482] Wu Xiaojian [武啸剑], 2023.

> mainstream value advantages on the basis of grasping the mechanism of social bot public opinion intervention [社交机器人舆论干预].[483]

Implicit Calls

Some PLA researchers strongly imply that they support PLA adoption but fall short of explicitly calling for China to employ its own social bots. Many of these PLA ideas sound like what Li Bicheng is proposing, suggesting growing consensus on the value of such AI-driven IO. For example, a 2021 *Military Correspondent* article by NDU professor Mu Qingsheng explains that it is currently possible to use social media to create a favorable narrative for one's own side by employing "social bots" that are capable of selecting channels through which to inject information into a large audience.[484] Other non-PLA researchers have drawn lessons from the ongoing war in Ukraine for understanding how social bots on Twitter can be used during a war.[485]

An earlier 2019 article that appears favorable by NUDT professor Liang Xiaobo described "intelligent bots" [智能机器人] as able to "use real or virtual identities [虚拟的身份] to influence public opinion and cover [inundate] their operational targets with information."[486] Liang envisioned that these bots could "purposefully implement information release [信息释放], information entanglement [信息纠缠], public opinion traction [舆论牵引], public opinion manipulation [舆论操控] and public opinion bombing [舆论轰炸]."[487] He also listed a long line of technologies that would enable them:

> big data resources, cloud computing technology, multilanguage translation, multilanguage application switching, multilanguage and cultural context simulation, simulation and real-time dynamic updating of cultural maps of specific regions, real-time analysis and decision support of new media crowds, full-domain data analysis, and real-time response systems.[488]

Finally, just like Li, Liang envisioned that humans would play a lesser role: "humans may become spectators on the battlefield of public opinion, or retreat to become behind-the-scenes

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[483] Wu Xiaojian [武啸剑], 2023.

[484] Mu Qingsheng [穆庆生], "A Brief Analysis of Modern Online Media Warfare with Intelligent Technology" ["智能技术视域下的现代网络媒体战浅析"], *Military Correspondent* [军事记者], November 2021.

[485] Rong Ting [荣婷] and Sun Jiaqian [孙佳倩], "Research on the '5D' Propaganda Strategy of Social Bots Based on the F-V Model Under Computational Propaganda: Taking Twitter Texts in War Situations as an Example" ["计算宣传下基于 F-V 模型的社交机器人 '5D' 宣传策略研究: 以战争情境中的推特文本为例"], *New Media and Society* [新媒体与社会], 2023.

[486] Liang Xiaobo [梁晓波], 2019.

[487] Liang Xiaobo [梁晓波], 2019.

[488] Liang Xiaobo [梁晓波], 2019.

commanders and decisionmakers on the battlefield of public opinion."[489] However, it is unclear how much of a technical and operational vision Liang had for this, as opposed to simply envisioning the theoretical possibility of such a system.

Much of this PLA discussion associates social bots with the PLA's CDO operational concept. A 2022 article on intelligentized CDO argued that in

> future cognitive domain warfare, covert control of the cognitive domain battlefield by autonomous weapons will become the norm. Social bots can create false public opinion and false hot spots as needed, thereby generating more individual perception fog; intelligent synthesis technology will lower the threshold for producing false information, thereby increasing the cost and difficulty of authentication; bot accounts and virtual human sources will be more difficult to identify; and "one-to-one" cognitive fraud will become increasingly common.[490]

A separate 2022 article by PLA NDU's Political Institute researchers on strategies for PLA CDOs also included social bots as an appealing option.[491] The article was funded by a 2021 nonpublic NSSF grant on "cognitive domain operations in the media space" [媒体空间的认知域作战].[492] The authors argued that for adopting AI,

> the most typical scenario in the field of cognitive domain warfare is to use chatbots [聊天机器人] and troll bots [水军机器人] to carry out saturated cognitive attacks [饱和认知攻击] on specific audiences [特定受众] on social media, so that specific audiences cannot correctly judge the current situation under such information attacks, and are more likely to be infected by emotions and fall into the preset 'cognitive trap' [认知陷阱].[493]

A February 2023 *PLA Daily* article on the role of computational propaganda for CDOs similarly included social bots as part of "cognitive suppression" [认知压制].[494] The article draws a distinction between using astroturfing [网络水军] and sock puppet accounts [傀儡账号] "to spread specific information widely in the media space and social platforms to achieve speech coverage" versus "cognitive domain operations bots" [认知域作战机器人], which are

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[489] Liang Xiaobo [梁晓波], 2019.

[490] Zhang Zhiwei [张智伟], "Cognitive Domain Operations from an Intelligentized Perspective" ["智能化视阈下的认知域作战"], *PLA Daily*, December 8, 2022.

[491] Yu Yuanlai [余远来] and Chen Qian [陈茜], 2022.

[492] The grant number is 2021-SKJJ-C-081. The grant also supported another article: Chen Qian [陈茜] and Yu Yuanlai [余远来], "Research on Guiding International Public Opinion About China from the Perspective of Computational Propaganda" ["计算宣传视角下涉华国际舆情引导研究"], *Military Correspondent* [军事记者], May 2022.

[493] Yu Yuanlai [余远来] and Chen Qian [陈茜], 2022.

[494] Xia Xiao [夏晓], "Computational Propaganda: A New Weapon in Cognitive Domain Operations" ["计算宣传: 认知域作战的新武器"], *PLA Daily*, February 28, 2023.

"automatically programmed agents aimed at intervening, manipulating, and blocking cognition" and can "automatically generate customized content and participate in cognitive activities like the human acquisition of information and social interaction."[495] This supports delivering and distributing content at large scale to target audiences, thereby "drowning opponents' voices, narratives, and opinions."[496] The author describes this as achieving "oppressive cognitive blocking" [压制性认知阻断], which they define as "information coverage bombing" [信息覆盖式轰炸] and denial of service attacks [拒绝服务式攻击].[497]

A separate February 2023 *PLA Daily* article described social bots as the main conduit for "public opinion covering" [舆论遮蔽], while stopping short of saying that China is currently doing or should be doing this.[498] The authors define this as an action that is intended to create a desired public narrative and then "influence the direction of public opinion" and that is "coordinated with specific offline actions at a specific time, including specific actions in the military and political fields."[499] The article notes that

> a common and effective method of exerting cognitive influence [认知影响] is to use machine learning to mine user emotions and prejudices to screen and target the most susceptible audiences, then quickly and intensively "shoot" customized "spiritual ammunition" [精神弹药] to the target group.[500]

The goal is to be the first to have one's own information reach the target audience, amidst all the other disinformation, to achieve a "first cause effect" [首因效应] and thus "confuse the target audience's cognition of the truth of the 'facts,' so as to achieve the purpose of influencing their psychology and manipulating their cognition."[501]

Other Clear Explanations

A 2020 article from the PLA's Media Broadcasting Center and NDU's Political Institute (previously Nanjing and Xi'an Political Institutes) argued that early AI would improve social bot

[495] Xia Xiao [夏晓], 2023.

[496] Xia Xiao [夏晓], 2023.

[497] Xia Xiao [夏晓], 2023.

[498] Duan Wenling [段文灵] and Liu Jiali [刘甲立], "Cognitive Confrontation on the Social Media Battlefield" ["社交媒体战场上的认知对抗"], *PLA Daily*, February 2, 2023.

[499] Duan Wenling [段文灵] and Liu Jiali [刘甲立], 2023.

[500] Duan Wenling [段文灵] and Liu Jiali [刘甲立], 2023.

[501] Duan Wenling [段文灵] and Liu Jiali [刘甲立], 2023.

performance, mirroring some of Li's arguments (although the authors do not cite Li).[502] They argue that

> practice has proved that the use of software robots to replace the traditional "robot army" [机器人水军] that uses social media accounts to promote public opinion can greatly improve the quality and efficiency of online public opinion guidance.[503]

They mirror Li's ideas for multiple systems to work together—in their terms, a writing bot and a posting bot—although they lack Li's focus on designing the complete end-to-end system.

Prefacing their argument with the statement that the PLA "is on the front lines of ideological struggle," they called for "accelerating the construction of military-related online public opinion struggle capabilities."[504] The article notes that AI is playing a bigger role:

> As the methods of online public opinion struggle are moving toward automation and intelligence, software robots [软件机器人] are replacing the traditional "bot army" [机器人水军] that uses social media accounts manually and have become an emerging force for public opinion guidance.

They argue that

> through the application of new technologies, such as cloud computing, big data, and artificial intelligence, the use of public opinion big data to actively discover hotspots, generate plans, and use AI to quickly write and automatically deliver information can realize the platformization, automation, and intelligence of online public opinion struggles.[505]

This will, in their words,

> provide comprehensive and real-time public opinion information support for public opinion struggle in a timely manner, free commanders from heavy information collection and analysis, shorten the time for operational decisionmaking, and greatly improve the efficiency of internet-related military public opinion struggles.[506]

The authors look to the purported adoption of social bots by the United States, Russia, and the United Kingdom as having had "a major impact on important political activities around the world and even the world's political landscape."

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[502] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], "Thoughts on Accelerating the Construction of Military-Related Online Public Opinion Struggle Capabilities" ["加快推进互联网涉军舆论斗争能力手段建设的思考"], *Political Work Journal* [政工学刊], 2020. Specific objectives include "disseminating the will of the country, the voice of the military, and resisting negative military-related public opinion information."

[503] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[504] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[505] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[506] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

In light of this, the authors call on the PLA to use AI to "improve the level of public opinion guidance."[507] They argue that

> the writing bot [写作机器人] can automatically produce a large amount of public opinion interference information, and the posting bot [发帖机器人] can automatically deliver information to preset target websites, platforms, mailboxes, and mobile phones of specific target groups.[508]

It can thus

> effectively influence and control the trend of online public opinion and occupy network information dissemination resources, thereby speeding up the speed of information dissemination and effectively form a large-scale and intelligent public opinion guidance capability against hostile forces' media websites, social platforms, and internet mainstream media websites, Weibo, WeChat and other media.[509]

Another idea of the authors is to improve the PLA's ability to attack adversary social networking sites through more traditional cyberattack capabilities. They argue that

> at present, in addition to guiding public opinion through propaganda to form a focus of attention, the use of network penetration attacks for hard damage to destroy computer programs and equipment and the use of cyber spyware for soft damage to steal core confidential information have become important means for the military organizations of various countries to carry out public opinion warfare.[510]

In light of this, they recommend the PLA should

> research and develop network attack tools for specific targets, such as hostile media website platforms, network lines, and network services, and use computer network and software system vulnerabilities to design and create Trojan horse viruses and phishing emails targeting networks, computers, mobile phones, smart televisions, and Internet of Things devices.[511]

This 2020 article also details some PLA shortcomings that align with Li's criticisms of PLA efforts, reinforcing the credibility of Li on this point.[512] The authors make three key recommendations for improved PLA IO on social media. First, the PLA should open more accounts for better influence operations because it had a poor posture (as of 2020). Second, the PLA should embrace better technology, including AI, for quicker and better IO because its

[507] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[508] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[509] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[510] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[511] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[512] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

technology is behind the times. Third, the PLA should improve Party-state coordination because it is weaker than desired.

First, the authors argue the PLA should "urgently open work accounts on more influential domestic and foreign online media," including social media, to "continuously expand its online public opinion struggle position," to be better prepared to shape domestic and foreign public opinion.[513] To frame this recommendation, the authors explain that,

> generally speaking, in the struggle to seize the initiative of online public opinion [. . . ,] compared with Western hostile forces, our military is less active in speaking, is less forceful in speaking, has a slower response speed, and has weaker online discourse power. We are always in a passive situation in which the enemy is attacking, and we are defending, and the enemy is strong and we are weak. In terms of building capabilities for military-related online public opinion struggle, we lag far behind some Western militaries.[514]

Specific problems included the fact that the PLA was (as of 2020) overly reliant on just a couple of authoritative online platforms (81.cn, MoD website) and for wartime or major operations, lacked "stealth, maneuverability and aggressiveness."[515]

Second, the authors argue the PLA should "use AI to quickly write and automatically deliver information," that is, content.[516] This is because, "at present, our military's ability to organize and carry out online public opinion struggle is relatively lagging behind, and the application of such technologies as cloud computing, big data, and artificial intelligence is relatively scarce."[517] The authors add that, PLA organizations "at all levels" "mainly rely on manual account registration, commenting on posts, etc., which is not only inefficient but also weak in function."[518] In response, beyond leveraging AI, the authors also argue the PLA should "urgently accelerate the application of new technologies, such as cloud computing, big data, and artificial intelligence, use public opinion big data to actively discover hotspots, generate plans . . . and promote the integration of technology and manpower."[519]

Third, the authors argue that the PLA should "build an online public opinion struggle collaboration platform, innovate online collaboration mechanisms, do a good job in military-local coordination, make good use of local resources, and fight online coordinated warfare."[520] This is because

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[513] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[514] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[515] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[516] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[517] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[518] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[519] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[520] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

> the institutional mechanism is not functioning smoothly. Judging from the large-scale training activities carried out by the military in recent years, there are few online public opinion confrontation links, the difficulty of confrontation is low, and the problem of poor operation mechanism of multidepartmental work is very prominent.[521]

Turning to shortcomings in military-civil coordination, the authors explain that "in terms of online public opinion struggle, there is still a lack of a military-civilian integrated command organization. The organization could integrate local media into the confrontation system but lacks the experience and tactics to carry out overall public opinion attacks."[522] However, in the authors' view, online public opinion struggle is a

> systematic project that requires the joint efforts of the military and the local government and the participation of the whole society. Every link in the struggle involves the military and local network management departments, online media, internet users, and military levels. All forces need to be mobilized to participate.[523]

Therefore, the authors argue, China should "establish a technical cooperation mechanism with internet mainstream media and social platforms, release authoritative information in a timely manner during wartime or major operations, expand positive propaganda, and dominate online public opinion."[524] They later add that

> the aggregation and integration of military and local human and material resources will help promote the integrated planning and formation of joint forces at all levels of the military and military online public opinion struggles, avoid redundant construction, and prevent separate battles.[525]

The authors also call for the PLA to treat IO as a joint capability, like Li Bicheng and other PLA IO researchers, apparently worried that PLA planning and, perhaps, leadership overlook IO.[526] The authors argue that "as an independent combat style, online public opinion warfare is the best way to realize the winning mechanism of information-based joint operations."[527] Echoing other PLA IO researchers, they base this claim on the idea that

> in the era of information warfare, the winning mechanism of joint operations no longer pursues siege and wealth plunder and is not aimed at killing a large number of the enemy's vital forces. Instead, it aims to destroy the enemy's

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[521] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[522] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[523] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[524] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[525] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[526] Beauchamp-Mustafaga, 2023a.

[527] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

> material foundation for survival and the tenacious will to resist to achieve the political goal of winning in small battles or winning without fighting.[528]

This means that

> compared with traditional operations, information-based joint operations are more politically sensitive, require a higher overall concept, and have a more complex battlefield environment. It is a combat operation that integrates political, economic, diplomatic, and military struggles.[529]

They frame this as protecting the regime in both crisis and wartime: "In wartime and major special public opinion struggle operations [重大专项舆论斗争行动], it can counteract the enemy and play a role in guiding public opinion."[530] The authors make two arguments, one bureaucratic and one strategic, for IO. The first is that the internet makes PLA political work have direct operational relevance: "The military-related online public opinion capability means have the direct combat function of political work."[531] The second is that PLA IO can help counterbalance U.S. advantages: "In the passive situation of insufficient power, [we should] enhance the offensive and defensive capabilities of public opinion in joint operations, and provide an important basis for military-related online public opinion struggles."[532]

Another challenge is tailoring information to target audiences. The authors want the PLA to "improve the accuracy and effectiveness of public opinion struggles" because "an important difficulty in the wartime public opinion struggle is how to implement focused communication for audiences with different social psychology, different cultural traditions, and different customs and to obtain cultural identity."[533] They expect both sides of a conflict to do this: "In the confrontation of public opinion in modern warfare, both warring parties pay great attention to studying the other party's ideology, social status, cultural characteristics, and national characteristics, and grasp its key points and weaknesses."[534] The goal is to "improve the accuracy and effectiveness" of these efforts and to improve "effectiveness evaluation."[535]

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[528] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[529] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[530] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[531] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[532] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[533] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[534] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020.

[535] Wu Yingxing [吴应星] and Wang Lancheng [王兰成], 2020. For more on effectiveness evaluation, see Beauchamp-Mustafaga, 2023a.

Lingering Fears

Despite this clear interest from a growing number of PLA researchers in leveraging social bots for China's own advantage, significant concerns over adversary (U.S.) use of this capability still permeate PLA discussions.[536] These concerns range from targeting college students at a time of youthful vulnerability, claims of U.S. politicians using social bots to smear the CCP online over COVID-19, and claims the United States is using social bots against Russia to support Ukraine in its ongoing war as well as how China could defend against similar U.S. efforts. Such concerns continued into at least 2023 and are very likely to persist.[537]

Flowing from this threat perception, another consistent topic of relevant PLA thinking and research is how to detect adversary social bots. For example, NUDT Press published an entire book on the topic in 2022.[538] A 2021 article by PLA NDU researchers that was supported by a PRC NSSF grant on public opinion risks argued that China should

> increase the research and development of relevant detection and early warning technologies; encourage scientific and technological innovations in countering deepfakes, bot trolls [机器人水军], and other technical fields; and use effective algorithms to accurately crack down on ideological attacks on [China] in globalized social communication.[539]

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[536] For some PLA writings on this, see Li Liuying [李留英], Sun Yixiang [孙亦祥], "Research on Military Information Content Security Driven by Threat Intelligence" ["威胁情报驱动的军事信息内容安全研究"], *Network Security Technology and Applications* [网络安全技术与应用], No. 3, 2022. On threats to college students, see Guo Xiaohang [郭晓航], "Challenges and Countermeasures of College Students' Ideological and Political Education from the Perspective of Online Public Opinion" ["网络舆论视角下大学生思想政治教育的挑战及对策"], *Journal of Chongqing University of Science and Technology (Social Sciences)* [重庆理工大学学报(社会科学)], Vol. 36, No. 5, 2022. On U.S. politicians using social bots to attack China, see Jun Sheng [钧声], "Political Manipulation and Disregard for Life Have Led to the Spread of the Pandemic" ["政治操弄，漠视生命导致疫情泛滥"], *PLA Daily* [解放军报], September 24, 2022. For an article by an AMS researcher, see Liu Jianqiang [刘建强], Lu Weidang [卢为党], and Huang Guoxing [黄国兴], "Research on Internet False Information Identification Based on Deep Learning" ["基于深度学习的互联网虚假信息识别研究"], *Technology Intelligence Engineering* [情报工程], Vol. 8, No. 5, 2022. On the United States using them against Russia in Ukraine, see Hou Xia [侯霞], "Analysis of the United States Information Warfare Against Russia in 2022 Russia-Ukraine Conflict" ["俄乌冲突中美国对俄信息战分析"], *Journal of Intelligence* [情报杂志], Vol. 42, No. 6, 2023.

[537] Chen Qian [陈茜] and Yu Yuanlai [余远来], 2022.

[538] Shao Chengcheng [邵成成], Chen Xiangguo [陈祥国], Zhu Junxing [朱俊星], and Deng Kefeng [邓科峰], *Social Big Data Mining: Analysis of the Role of Social Bot Accounts* [社交大数据挖掘: 社交机器账户作用分析], National Defense University of Technology Press [国防科技大学出版社], 2022.

[539] Yu Yuanlai [余远来] and Sun Yixiang [孙亦祥], "Research on Global Social Communication and Cyberspace Ideological Governance" ["全球社交化传播与网络空间意识形态治理研究"], *International Communications* [对外传播], No. 11, 2021. The grant name is "Research on the Risk and Governance of Internet Public Opinion" (网络舆情风险与治理问题研究), grant number 17BSH028.

Similarly, a 2022 article described PLA defense capabilities as poor and specifically said that the PLA should learn from the publicly available BotOrNot tool because China's "existing social bot recognition technology is still immature."[540]

Other Party-State Interest: MFA

Unsurprisingly, other parts of the Party-state also appear to recognize the value of social bots in supporting Chinese narratives abroad. While a full review of broader Party-state thinking on the topic is outside the scope of this report, initial exploratory research found a 2019 article coauthored by a researcher at the MFA's China Foreign Affairs University that strongly implied support for the MFA adopting this capability moving forward.[541] The article bemoans that "China has abandoned the computational propaganda war on Twitter" and rails against "extending the international communication pattern of 'the West is strong and we are weak' from the traditional media era to the internet age."[542] It points out that "instead of carrying out large-scale computational propaganda on social media platforms, such as Facebook and Twitter, China is suffering from the negative impact of computational propaganda on China's national image."[543] Viewing apparent MFA efforts to address this problem (as of 2019) as insufficient, the authors add that "it is far from enough to clarify the truth about China's issues through counterpropaganda activities, such as 'Emperor's Expedition' [帝吧出征] and 'Fanquan Girls Protect China' [饭圈女孩保护中国], initiated by nongovernment forces."[544] The MFA-affiliated article cites a 2019 Oxford Internet Institute study on social media data from 2017 that found "no evidence . . . of pro-Chinese state automaton on Twitter," as evidence for this poor MFA performance.[545] This matches reports of MFA engaging in social media manipulation by at least 2019, very likely to buy followers in an effort to artificially boost ambassadors' social media

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[540] Long Yameng [龙亚蒙] and Zhou Yang [周洋], 2022.

[541] Ou Ya [欧亚] and Xia Yue [夏玥], 2019. For an article by non-UFWD researchers published in a UFWD journal that claims foreign countries are using social bots to smear China's human rights record and that appears highly favorable to responding with China's own social bots, see Xiang Debao [相德宝], Chen Qian [陈茜], and Xu Xiongxiong [徐雄雄], "The Public Opinion Intervention of Social Bots on China-related Human Rights Issues and China's Coping Strategies" ["社交机器人对涉华人权议题的舆论干预及中国应对策略"], *Journal of United Front Science* [统一战线学研究], 2023. For an article by two Tsinghua researchers on social bots using images to support China's foreign propaganda, see Huang Yangkun and Chen Changfeng. "Automation of Visual Communication and Aesthetic Construction of National Image: A Computational Aesthetic Analysis of Social Bots on Twitter," *Online Media and Global Communication*, Vol. 3, No. 1, 2024.

[542] Ou Ya [欧亚] and Xia Yue [夏玥], 2019.

[543] Ou Ya [欧亚] and Xia Yue [夏玥], 2019.

[544] Ou Ya [欧亚] and Xia Yue [夏玥], 2019.

[545] Gillian Bolsover and Philip Howard, "Chinese Computational Propaganda: Automation, Algorithms and the Manipulation of Information About Chinese Politics on Twitter and Weibo," *Information, Communication & Society*, Vol. 22, No. 14, 2019.

activity and more broadly support Chinese diplomatic talking points on Western social media.[546] This suggests MFA researchers believed the MFA needed to get more actively involved, and echoed complaints by the MFA spokesperson in a July 2019 *Study Times* article, where she complained that Beijing lacked a "fighting spirit" and that "we still do not grasp the microphone completely in our hands."[547]

The 2019 MFA-affiliated article explains that social bots provide advantages for delivering propaganda. It argues, "computational propaganda is a propaganda model [宣传模式] with scale, digitization, and precise effects" because it can be done "on a large scale at a cost far lower than that of manual labor and with a much higher efficiency than manual labor."[548] This, in turn, allows it to "change the proportion of information and opinions in the public opinion environment and form an 'opinion climate' that supports or opposes a certain political figure or political issue."[549] The author argues that "relevant departments need to face up to this problem, including increasing research on the principles, models and technologies of computational propaganda, so as to open up a new situation for China's international communication."[550] The authors appear to almost shame the MFA into acting: "To some extent, it depends on how much wisdom and courage we have to carry out concept innovation, system construction, and resource integration in the face of challenges."[551]

As another example, in late 2022, *People's Daily Online*, a subsidiary of the *People's Daily* and part of China's propaganda system, held an open competition for automatically generating text content for social media posts.[552] Specifically, based on a provided Weibo conversation dataset, contestants were asked to "train a text generation model based on the given dataset to generate natural, fluent, informative, and topic-specific reply content." While it is unclear what the ultimate purpose was, clearly there is more awareness and interest in automatically generating text for social media from other parts of the Party-state.

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[546] Erika Kinetz, "Army of Fake Fans Boosts China's Messaging on Twitter," Associated Press, May 28, 2021. For more on the MFA's embrace of Western social media, see Brandt and Schafer, 2020; Erika Kinetz, "Anatomy of a Conspiracy: With COVID, China Took Leading Role," Associated Press, February 15, 2021.

[547] Hua Chunying [华春莹], "Occupy the Moral High Ground and Enhance International Discourse Power" ["占据道义制高点，提升国际话语权"], *Study Times* [学习时报], July 12, 2019, translation via Zhang et al., 2020.

[548] Ou Ya [欧亚] and Xia Yue [夏玥], 2019.

[549] Ou Ya [欧亚] and Xia Yue [夏玥], 2019.

[550] Ou Ya [欧亚] and Xia Yue [夏玥], 2019.

[551] Ou Ya [欧亚] and Xia Yue [夏玥], 2019.

[552] "NLP Competition Practice: People's Daily Algorithm Competition Weibo Comment Generation" ["NLP 比赛实操: 人民网算法赛微博评论生成"], International Competition Alliance [国际竞赛联盟], February 25, 2023.

Looking Forward to Generative AI-Driven Social Bots

The advent of ChatGPT and advances in generative AI have given PLA IO researchers more hope (and fear) that social bots will be even more capable moving forward.[553] While this was already consensus with earlier forms of AI, generative AI has likely made this expectation even higher.[554] For example, a 2023 article by CETC researchers argued that, "after social bots based on ChatGPT are instilled with personalities, positions and tendencies, they can become invisible on the internet and become cognitive shaping tools. They are more influential and concealed than traditional [human-run] astroturfing [网络水军]."[555] Liang Xiaobo similarly wrote in 2023,

> The use of a large-scale intelligent systems, equipment and technologies, such as intelligent bots [智能语音应答技术], intelligent text [智能文本], images, discourse, and other systems and, especially, the birth of large language intelligent models have pushed CDOs into a revolutionary intelligent era.[556]

Liang also envisions what future generations of social bots may look like for CDO with generative AI: Leveraging

> intelligent voice response technology [智能语音应答技术], intelligent image service bot technology [智能图像服务机器人技术], intelligent video service bot technology [智能视频服务机器人技术], intelligent news article writing bot technology [智能新闻稿件撰写机器人技术], intelligent multimodal information generation service bot technology [智能多模态信息生成服务机器人技术], specific field intelligent bot technology [特定领域智能机器人技术], and military struggle individual cognitive domain combat information

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[553] For more on PLA views of generative AI applications for IO, see Beauchamp-Mustafaga, 2024.

[554] For some articles pre-2023, see Sun Yixiang [孙亦祥] and Yu Yuanlai [余远来], 2022; Liang Xiaobo [梁晓波], "How Artificial Intelligence Affects Public Opinion Wars" ["人工智能如何影响舆论战"], *PLA Daily*, March 2, 2021a; Zhang Zhiwei [张智伟], 2022; Li Yutian [李雨田] and Zhang Maolin [张茂林], "The Era of Intelligent Media: The Application of Social Bots in Cognitive Domain Confrontation and its Enlightenment" ["智媒时代: 社交机器人在认知域对抗中的运用及启示"], *Artificial Intelligence Security* [智能安全], 2022.

[555] Zhou Zhongyuan [周中元], Liu Xiaoyi [刘小毅], and Li Qingwei [李清伟], "ChatGPT Technology and Its Impact on Military Security" ["ChatGPT 技术及其对军事安全影响"], *Command Information System and Technology* [指挥 信息系统与技术], April 2023. This quote is drawn from Beauchamp-Mustafaga, 2024. See also Wang Yashen [王亚珅], Li Qiang [李强], and Shi Ge [石戈], "Analysis of Impact of ChatGPT on Development of Social Bot Technology" ["ChatGPT 对社交机器人技术发展的影响分析"], *Unmanned Systems Technology* [无人系统技术], 2023; Wu Xiaojian [武啸剑], 2023; Chen Changxiao [陈昌孝], Li Hao [李浩], and Chao Shuai [晁帅], "An Exploration of the Efficacy Mechanism and Key Technologies of Algorithmic Cognitive Warfare" ["算法认知战的致效机理与关键技术探析"], *Information Security and Communications Privacy* [信息安全与通信保密], December 2023; Hua Rui [华瑞], Yang Longxiao [杨龙霄], and Yang Runxin [杨润鑫], "When Generative Artificial Intelligence Heads to the Battlefield" ["当生成式人工智能走向战场"], *PLA Daily*, December 1, 2023.

[556] Liang Xiaobo [梁晓波], "Warfare Capability of Cognitive Domain: An Overseas Observation" ["认知作战能力域外观"], *Frontiers* [学术前沿], June 2023.

> transmission robot technology [军事斗争单兵认知域作战信息传输机器人技术].[557]

This would suggest an interest in both generalized social bots and highly specialized social bots.

Conclusion

Although Li Bicheng was early in his advocacy for China to leverage social bots, the PLA and likely other parts of the Party-state are following in his footsteps and have expressed interest in developing such a capability. Generative AI is very likely to supercharge these efforts, making this an important topic to watch.

[557] Liang Xiaobo [梁晓波], 2023.

Chapter 8. Findings and Recommendations

Li Bicheng is likely just one of many researchers supporting broader Party-state foreign influence operations.[558] These activities to shape global conversations and narratives about the CCP and conduct targeted political interference through social media—and many other means not highlighted in this report—are all part of the CCP malign influence operations that former Australian prime minister Malcom Turnbull defined as "covert, coercive, or corrupting."[559]

We hope this report will spur further research into the underlying technical foundations of Chinese social media manipulation, in the hopes of better understanding Chinese capabilities and better countering Chinese efforts. For example, despite the April 2023 U.S. Department of Justice indictment of dozens of MPS officers for conducting social media manipulation, there is little understanding of how the MPS actually orchestrated this activity. The February 2024 iSoon leak provides some information but is mostly focused on offensive cyber theft, with some social media data collection but little on operating a social media manipulation campaign.[560] One potential lead is a likely MPS-affiliated article written by Chinese researchers from the Beijing Information Science and Technology University and Beijing Open University in July 2022.[561] The authors developed a temporal sequence GAN that, in their words, "automatically generates online comments, aiming to counteract malicious information on social networks and guide the correct direction of public opinion." The authors specifically disclose funding from MPS' Key Laboratory of Information Network Security, China's National Natural Science Foundation (NNSF), and others.[562] Although this came before the rise of generative AI, this approach is reasonably sound for generating comments within the context of a specific domain's speech but would likely fall short of being robust enough in a general context for chat-style interactions, at which LLMs excel. Suffice to say that it will be important to further explore other Party-state actors to understand how they are developing their capabilities and adapting to the world of generative AI.

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[558] Our conclusions build on earlier RAND research on this topic, including Marcellino et al., 2023, and Beauchamp-Mustafaga, 2024.

[559] Malcolm Turnbull, "Speech Introducing the National Security Legislation Amendment (Espionage and Foreign Interference) Bill 2017," December 7, 2017; U.S. Department of Justice, "40 Officers of China's National Police Charged in Transnational Repression Schemes Targeting U.S. Residents," press release, April 17, 2023.

[560] Paul Mozur, Keith Bradsher, John Liu, and Aaron Krolik, "Leaked Files Show the Secret World of China's Hackers for Hire," *New York Times*, February 22, 2024.

[561] Liu Xinran [刘欣然], Xu Yabin [徐雅斌], and Li Jixian [李继先], "Method for Automatically Generating Online Comments" ["网评贴文自动生成方法研究"], *Data Analysis and Knowledge Discovery* [数据分析与知识发现], Vol. 7, No. 4, July 2022.

[562] Additional funding was from the Key Laboratory of Network Culture and Digital Communication of Beijing, under grant XN004. NNSF grant number was 61672101 and MPS grant number was C18601.

Findings

The Chinese Military Likely Began Developing Its Social Media Manipulation Capabilities by the Mid-2010s and Almost Certainly Began Employing Them by 2018, but the PLA Is One of Many Actors

Chinese military interest in cyber-enabled influence operations began by the mid-2000s, under the concept of online public opinion warfare, but this appears to have entailed a fairly limited set of actual activities, such as releasing propaganda online. Social media platforms, both foreign and domestic, provided a new opportunity to reach the military's intended targets. After initial fear of social media as a threat to regime security in the late 2000s, at least some in the PLA recognized the potential value for influence operations by the early 2010s.

The Chinese military likely began a concerted effort to develop an ability to manipulate both domestic and foreign social media in the mid-2010s. While it is difficult to definitely establish a causal link between the establishment of the PLASSF and the decision to develop these capabilities, at a minimum the fact that both events happened around the same time very likely reflects senior PLA leadership's broader recognition that the PLA should leverage the greater connectivity afforded by the internet (including cyber-delivered messaging) for its influence operations—precisely one of the motivations for the PLASSF. Taiwanese accusations of PLASSF involvement in Chinese election interference efforts against Taiwan in 2018 stand as a clear indication of when the PLA had stood up at least an initial operational capability.

Li Bicheng serves as a colorful example of this evolution from fear to love of social media for influence operations. While his initial research during the 2000s was focused on understanding Chinese domestic public opinion online, he began working on a system for online influence operations by at least 2016, and possibly by 2014. We argue that his move from IEU under the PLASSF to Huaqiao University under the UFWD reflected a deepening Party-state interest in exactly this research, either to support UFWD efforts or to operationalize his work for the PLASSF's Base 311 unit.

The Chinese military is just one of many Party-state actors engaged in foreign social media manipulation, with a likely federated approach with a low level of coordination and deconfliction between actors. This means that following just PLA developments is not enough—foreign observers must also go beyond understanding the PLA to understanding other actors as well.

The Chinese Military Is Clearly Interested in Leveraging AI for Social Media Manipulation, and at Least Some Chinese Military Researchers Conduct Cutting-Edge Work

Our survey of Chinese military writings reveals broad recognition of the power of AI, including for social media manipulation. One driver of PLA interest in the CDO operational concept is the rise of AI and desire to incorporate this emerging technology into PLA influence

operations. High-quality evidence suggests that the PLA has indeed already been actively working on such capabilities for several years.

Our technical evaluation of Li's research reveals that he follows global research trends on AI and that his vision for AI-driven IO in 2019 presaged the arrival of generative AI. Although his research is not always quite as truly innovative as he claims, he has consistently done good work in NLP. We argue that while Li is a good case study, many more Chinese researchers are likely also working to leverage these capabilities for broader Party-state efforts.

The Chinese Military and Broader Party-State Are Likely Well-Placed to Adopt Generative AI for Social Media Manipulation, Including to Run Social Bots for Large-Scale Influence Efforts

Given the Chinese military's clear interest in leveraging AI and, specifically, the ubiquitous nature of generative AI, the PLA is very likely to be able to adopt this new technology for its social media manipulation efforts, among many other military applications. Although the United States currently leads in generative AI development around the world, Chinese companies are not far behind and are likely to keep pace in the near to medium terms. Moreover, the availability of high-quality (mostly foreign) open-source models and ease of fine-tuning for specific social media manipulation purposes will likely compensate for any deficiencies of domestic companies. Finally, the Chinese military is unlikely to set as high a bar for its generative AI requirements for influence operations as private companies seeking commercial success do. These considerations likely apply to the broader Party-state as well, given the low bar to entry.

One likely application of generative AI for the PLA is to run large-scale social bot networks to support its astroturfing, among other tactics. One of the main benefits of generative AI is to be able to create the appearance of humanlike accounts at scale on social media, and this is well-suited to preexisting Chinese military interest in influencing domestic and foreign public opinion. Moreover, multiple Chinese military researchers have specifically called for doing this, as discussed in Chapter 7, although that was before the rise of generative AI.

Li's early interest in generative AI-like capabilities circa 2019 and the explicit interest of other PLA researchers since ChatGPT's release demonstrates that at least some in the PLA and likely broader Party-state appreciate its potential. This includes covert use of ChatGPT attributed to a known Chinese actor, Spamouflage, in 2024, and use of U.S. open-source models by PLA researchers for other purposes.[563] Li's expertise is likely to enable him to leverage generative AI, and his December 2023 patent on fine-tuning suggests that he is already working on doing so. We argue it is only a matter of time before Li embraces generative AI for his vision for an AI-driven social media manipulation system, although it will bear watching whether there is open-source evidence of this.

[563] OpenAI, 2024b.

The Chinese Military Justifies Its Social Media Manipulation Efforts in Part Based on a Threat Perception About U.S. Activity Seeking to Undermine the CCP Regime

Authoritative Chinese military texts make clear that China views social media as an acute threat to PLA prestige and regime security. The most threatening part about social media, in the PLA's view, is that the United States is using social media to undermine authoritarian regimes, including the CCP. This view is broadly shared across the Party-state. Public reports of U.S. government activity, specifically covert influence operations, on social media almost certainly reinforce Beijing's assumption that the United States is seeking to undermine its rule.

Li's writings are a good example of a Chinese perspective that its own social media manipulation in merely a response to U.S. and other activity and is, thus, justified, necessary, and proportionate. While this does not excuse Chinese efforts, it is important to understand this perspective to better understand Chinese behavior and potential future trends.

Recommendations

Our research findings led us to several key recommendations for the U.S. government and broader policy community.

The United States and Other Global Democracies Should Prepare for AI-Driven Social Media Manipulation

As the early wave of experimentation with generative AI by malign actors highlights, the low bar to adoption and high impact for performance improvement will very likely make generative AI a core part of future social media manipulation campaigns. In light of this, there are several steps the U.S. and other governments can take to make progress ahead of the likely coming wave of broader adoption.[564]

Risk Reduction

The ubiquity of generative AI makes it difficult to regulate; thus, governments and the private sector must take actions on their own to reduce the risks and impact of the technology. First, social media platforms could be required to label content posted to their platforms that is created with generative AI. Second, social media platforms could be required to increase their efforts to combat fake accounts; these are now likely the main limiting factor in social media manipulation. Third, governments and the private sector should invest in capabilities to detect generative AI–produced content. This would certainly benefit from some government investments, given the likely long-term effort required for success, but social media platforms have a business incentive to identify and remove inauthentic content from their platforms and, thus, should also be encouraged to invest in these capabilities. Public-private partnerships are

[564] This draws from Beauchamp-Mustafaga, 2024.

also possible, between governments and social media companies and/or with academia and nonprofits.

Promote Media Literacy and Government Trustworthiness

First, the U.S. government should broadly support media literacy as one of several long-term policies to address the increasingly complicated information environment facing the U.S. public. One part of this could include improving media literacy training for U.S. government employees to better identify generative AI–produced content and, more broadly, inauthentic content. Another part is supporting efforts to improve the media literacy of the broader U.S. public, again focusing especially on identifying inauthentic content and, more basically, adopting a critical mindset for media consumption. Finally, the U.S. government should pursue blockchain, watermarking, and other related technologies that may be able to provide the public confidence in authentic media, particularly those from the U.S. government. Malign actors, such as China, take advantage of uncritical media consumption and seek, in part, to discredit the U.S. government in the eyes of its citizens.

Public Reporting

Given the limited open-source information currently available about malign actors' adoption of generative AI for influence operations, the U.S. government should release as much information as possible to improve public understanding of this threat and, more importantly, to strengthen confidence in U.S. elections. First, the U.S. government could publish an annual report that is focused on foreign malign actors' influence efforts targeting the United States, including social media. The U.S. government is already providing some of this information, but it is fragmented across various reports—DoD's *China Military Power Report*, ODNI's Worldwide Threat Assessment, the U.S. Department of State Global Engagement Center's occasional reports. The problem is that this approach is both not comprehensive and reactive. Instead, the U.S. public would benefit from a consistent, coherent report. For DoD, U.S. Indo-Pacific Command J2, the Defense Intelligence Agency, the 5th Psychological Operations Battalion, and the 7th Psychological Operations Group could all support this monitoring and provide information for public reporting, although the Defense Intelligence Agency may be the natural nexus for such efforts.

Increasing Diplomatic Coordination

The ubiquitous nature of generative AI and the breadth of Chinese IO efforts means that the United States does not have to counter Beijing alone. The United States should work to build an international coalition to raise awareness of this growing threat, share information on Chinese activity, and coordinate multilateral responses. First, Washington should encourage Taipei to increase the information it shares about Chinese efforts, including revealing more information publicly and providing more information to other governments (and perhaps researchers)

privately. Second, Washington should encourage and actively support Taipei's collaboration with other countries to collect lessons learned and best practices through innovative forums and platforms for these conversations. Given some sensitivities engaging with Taipei, Washington should seek to provide flexible options for this collaboration, for example, through the Global Cooperation and Training Framework. Finally, Washington should also seek out multilateral cooperation with other global democracies to build coalitions for these efforts, such as through public-private investments from the Australia, United Kingdom, and U.S. (AUKUS) or Australia, India, Japan, and United States (QUAD) partnerships in technology to identify generative AI content. U.S. outreach could also encourage allies and partners to improve their own public reporting and could even support coordinated joint statements, such as recent public reporting by U.S. allies on Chinese cyberattacks.

The U.S. Government Should Conduct an Independent, Comprehensive Evaluation of Its Information Efforts and Ensure That the Benefits Outweigh the Costs

Given the apparent tit-for-tat retaliation perspective that is in part driving Chinese influence operations against United States, the U.S. government would benefit from an independent and comprehensive evaluation of its information efforts to better understand their true net benefit. This is not to say that all U.S. information efforts are futile or incur more costs than benefits, but it is unclear how much big picture consideration there is for these activities, and the point is certainly worth better understanding.[565] One could argue that CCP paranoia about U.S. intentions and fear of uncontrolled information sources would already predispose Beijing toward offensive influence operations, although this historical counterargument is ultimately untestable.

This review could consider at least three key aspects and could include not just DoD, which is the main focus of the PLA's concern, but also other relevant parts of the U.S. government. First, does U.S. government activity align with broader strategic priorities and messaging? This review could also consider the second-order effects, such as whether the benefits from U.S. government activities targeting one actor outweighed the potential negative consequences in behavior from other actors. Second, what is the best way to discuss these capabilities publicly? For DoD, as an example, the review could consider whether U.S. combatant command activities align with stated overarching priorities from senior civilian leadership in the Pentagon. Third, the review could include a net assessment of how U.S. information capabilities stack up against potential PLA automated information capabilities, for both offensive and defensive purposes.

[565] For one recent report on some aspects of this, see Christopher Paul, William Marcellino, Michael Skerker, Jeremy Davis, and Bradley J. Strawser, *Planning Ethical Influence Operations: A Framework for Defense Information Professionals*, RAND Corporation, RR-A1969-1, 2023.

The U.S. Government Should Consider Engaging with Beijing on Restricting AI-Driven Influence Operations

The PRC MFA's October 2023 policy proposal against AI-driven influence operations provides an opportunity for the U.S. government to engage Beijing to both test its sincerity and work to establish global norms.[566] The resumption of some amount of U.S.-China official Track 1 dialogue following the meeting between President Joe Biden and General Secretary Xi in November 2023 and the accompanying uptick in broader Track 2 engagements between the two sides make this more possible now than in recent years. Although Biden and Xi agreed about a dialogue on AI, most of the interest appears to be in governing military AI, apparently leaving out AI-driven influence operations.[567] Understanding that Beijing's past compliance with its agreements has been mixed at best, the U.S. government should at least consider the potential benefits of another agreement on restricting AI-driven influence operations. At a minimum, such an agreement would provide the United States the rhetorical high ground to hold Beijing accountable if Beijing does not live up to its promises—for example, that Xi promised Biden China would not interfere in the upcoming 2024 U.S. elections.

Second, another benefit from a U.S-China agreement would be to set a global norm that countries should not use generative AI for influence operations and should further restrict nonstate actors in their territories from using generative AI as well. Even if Beijing does not abide by the agreement, it could prove more persuasive to middle powers with high-end cyber capabilities, such as some Middle East countries.

At the same time, Washington should also continue to call out Beijing's malign activity if it fails to live up to its own pledge.

The U.S. Policy Community Would Benefit from Additional Research

Building on the research in this report and by the broader research community, there are many outstanding questions that additional research would help inform for U.S. policymakers.

Better Understand PRC Whole-of-Government Cooperation on Social Media Manipulation

The lack of clarity on how Chinese government efforts are coordinated at a high level makes it a challenge to understand high-level decisionmaking on this topic. Li Bicheng's move from PLASSF IEU to Huaqiao University under the UFWD raises the previously underappreciated possibility that these two actors within the Chinese system—previously considered to be relatively distant from one another—have some amount of cooperation. Given the significant number of suspected active actors within the Chinese system—MFA, MPS, Propaganda

[566] Beauchamp-Mustafaga, 2023b.

[567] Graham Webster and Ryan Haas, "A Roadmap for a US-China AI Dialogue," Brookings Institution, January 10, 2024; Ryan Hass and Colin Kahl, "Laying the Groundwork for US-China AI Dialogue," Brookings Institution, April 5, 2024.

Department, etc.—the potential that these actors are actually coordinating their efforts could make overall Chinese efforts more effective and is thus important to watch.

Better Understand UFWD as a Social Media Manipulation Actor

While most of the attention on Chinese government social media manipulation efforts has focused on the Propaganda Department, MFA, and PLA, the role of the UFWD is also worth additional research. Although the UFWD may lack some of the underlying technical capabilities that likely make the PLA a much more significant actor, the UFWD's considerable external focus and breadth of activity could offer some benefits for its own social media manipulation efforts.

Better Understand the Technical Approach of Other Party-State Actors

This report demonstrates that it is possible to understand the underlying technical approaches of at least some Chinese Party-state actors via open-source research. While this may not be replicable to all malign actors within the Chinese system and beyond, there is value both for better attribution and for better understanding the potential trajectory of malign actor activity.

Better Understand Party-State Cooperation with Chinese Companies for Social Media Manipulation

A growing body of evidence suggests that Chinese companies are playing a growing role in Party-state efforts.[568] Li's connections with Meiya Pico highlights one of many likely growing ties. Especially since Chinese companies are much more likely to lead on generative AI development than the Chinese government, the role of private companies (and state-owned enterprises) in supporting Chinese influence operations will likely become more pronounced. It will be important to understand these dynamics to better mitigate these threats.

[568] Chandra and Navarre Chao, 2023.

Abbreviations

AI	artificial intelligence
AMS	Academy of Military Science
ASPI	Australian Strategic Policy Institute
AUKUS	Australia, United Kingdom, and United States
BERT	Bidirectional Encoder Representations from Transformers
BLEU	Bilingual Evaluation Understudy
CCP	Chinese Communist Party
CETC	China Electronics Corporation
CDO	cognitive domain operation
CIIS	China Institute of International Studies
CNS	China News Service
COVID-19	coronavirus disease 2019
DoD	U.S. Department of Defense
GAN	generative adversarial network
IEEE	Institute of Electrical and Electronics Engineers
IEU	Information Engineering University
IO	influence operation
LLM	large language model
MFA	Ministry of Foreign Affairs
MPS	Ministry of Public Security
MSS	Ministry of State Security
NDU	National Defense University
NED	National Endowment for Democracy
NIC	National Intelligence Council
NLP	natural language processing
NSD	Network Systems Department
NSSF	National Social Science Fund
NUDT	National University of Defense Technology
ODNI	Office of the Director of National Intelligence
PLA	People's Liberation Army
PLACSF	People's Liberation Army Cyberspace Force
PLASSF	People's Liberation Army Strategic Support Force
PRC	People's Republic of China
UFWD	United Front Work Department

References

Unless otherwise indicated, the authors of this report provided the translations of bibliographic details for the non-English sources included in this report. To support conventions for alphabetizing, sources in Chinese characters are introduced with and organized according to their English translations. The original rendering in Chinese appears in brackets after the English translation.

"2019 Media Transformation and Development in the Artificial Intelligence Era Research Report" ["2019 年度"人工智能时代媒体变革与发展"研究报告"], Xinhua [新华], 2019. As of September 29, 2023: http://www.xinhuanet.com/politics/download/2019ndrgznsdmtbgyfzyjbgqwjwjdcjg.pdf

Academy of Military Science, Military Strategy Department [军事学学院战略研究部], *Science of Military Strategy* [战略学], 3rd ed., Military Science Press [军事科学出版社], 2013.

Allen, Bethany, *Beijing Rules: How China Weaponized Its Economy to Confront the World*, HarperCollins, 2023.

Alliance for Securing Democracy, "Hamilton 2.0 Dashboard," webpage, undated. As of August 12, 2024: https://securingdemocracy.gmfus.org/hamilton-dashboard/

Andreas, Jacob, "Language Models as Agent Models," paper, 2022.

Bachman, Elizabeth, *Black and White and Red All Over: China's Improving Foreign-Directed Media*, CNA Corporation, August 2020.

Ban Wentao [班文涛] and Xie Mingxiu [谢明修], "Three Reliances: Using Artificial Intelligence Technology to Innovate Public Opinion Warfare—Research and Enlightenment on the Application of Artificial Intelligence Technology to Public Opinion Warfare by the United States and Other Western Countries" ["三个依托: 利用人工智能技术创新舆论战: 美国等西方国家将人工智能 技术应用于舆论战研究与启示"], *Military Correspondent* [军事记者], January 2023.

Bandurski, David, "Signals from Xi's Speech on Ideology," China Media Project, August 23, 2018.

Bandurski, David, "Powers of Persuasion," China Media Project, June 2, 2021.

Bandurski, David, "Bringing AI to the Party," China Media Project, April 14, 2023.

Beauchamp-Mustafaga, Nathan, *Chinese Next-Generation Psychological Warfare: The Military Applications of Emerging Technologies and Implications for the United States*, RAND Corporation, RR-A853-1, 2023a. As of July 13, 2023: https://www.rand.org/pubs/research_reports/RRA853-1.html

Beauchamp-Mustafaga, Nathan, "Biden Should Call China's Bluff on Responsible AI to Safeguard the 2024 Elections," *RAND Blog*, November 14, 2023b. As of August 12, 2023: https://www.rand.org/pubs/commentary/2023/11/biden-should-call-chinas-bluff-on-responsible-ai-to.html

Beauchamp-Mustafaga, Nathan, *Exploring the Implications of Generative AI for Chinese Military Cyber-Enabled Influence Operations: Chinese Military Strategies, Capabilities, and Intent*, RAND Corporation, CT-A3191-1, 2024. As of August 12, 2024: https://www.rand.org/pubs/testimonies/CTA3191-1.html

Beauchamp-Mustafaga, Nathan, and Michael S. Chase, *Borrowing a Boat Out to Sea: The Chinese Military's Use of Social Media for Influence Operations*, Johns Hopkins University, School of Advanced International Studies, Foreign Policy Institute, 2019.

Beauchamp-Mustafaga, Nathan, and Jessica Drun, "Exploring Chinese Military Thinking on Social Media Manipulation Against Taiwan," *China Brief*, Vol. 21, No. 7, April 2021.

Beauchamp-Mustafaga, Nathan, and Jackson Smith, "Cognitive Domain Operations Against Vietnam Hint at Broader Ambitions," *China Brief*, June 2024.

Behsudi, Adam, and Doug Palmer, "Trump Administration Blacklists Chinese Firms Linked to Surveillance of Uighur Minority," *Politico*, October 7, 2019.

Bing, Christopher, and Joel Schectman, "Pentagon Ran Secret Anti-Vax Campaign to Undermine China During Pandemic," Reuters, June 14, 2024.

Blanchard, Ben, "China, Asked About U.S. Election Interference, Says Does Not Interfere in Other Countries' Affairs," Reuters, September 19, 2018.

Blanchard, Ben, "Taiwan Says China has 'Very Diverse' Ways of Interfering in Election," Reuters, October 4, 2023.

Blanchard, Ben, and Michael Martina, "China's Xi Urges State Media to Boost Global Influence," Reuters, February 19, 2016.

Blanchard, Ben, and Sui-Lee Wee, "China Names Conservative, Older Leadership," Reuters, November 15, 2012.

Boiko, Daniil A., Robert MacKnight, and Gabe Gomes, "Emergent Autonomous Scientific Research Capabilities of Large Language Models," paper, 2023.

Bolsover, Gillian, and Philip Howard, "Chinese Computational Propaganda: Automation, Algorithms and the Manipulation of Information About Chinese Politics on Twitter and Weibo," *Information, Communication & Society*, Vol. 22, No. 14, 2019.

Bowe, Alex, China's Overseas United Front Work: Background and Implications for the United States, U.S.-China Economic and Security Review Commission, August 2018.

Brady, Anne-Marie, "Magic Weapons: China's Political Influence Activities Under Xi Jinping," Wilson Center, 2017a.

Brady, Anne-Marie, "Plus Ça Change? Media Control Under Xi Jinping," *Problems of Post-Communism*, Vol. 64, No. 3, 2017b.

Bran, Andres M., Sam Cox, Oliver Schilter, Carol Baldassari, Andrew D. White, and Philippe Schwaller, "Augmenting Large Language Models with Chemistry Tools," 2023.

Brandt, Jessica, and Bret Schafer, "How China's 'Wolf Warrior' Diplomats Use and Abuse Twitter," Brookings Institution, October 28, 2020.

Brazys, Samuel, Alexander Dukalskis, and Stefan Müller, "Leader of the Pack? Changes in 'Wolf Warrior Diplomacy' after a Politburo Collective Study Session," *China Quarterly*, Vol. 254, 2023.

Bruzzese, Matt, and Peter Singer, "Farewell to China's Strategic Support Force. Let's Meet Its Replacements," Defense One, April 28, 2024.

"Breathe with the Party and the People, and Progress with the Times" ["与党和人民同呼吸, 与时代共进步"], *People's Daily*, February 21, 2016.

Bu Jiang [卜江], Lao Songyang [老松杨], Bai Liang [白亮], and Liu Haitao [刘海涛], "Research on the Mechanism of Video-Based Implied Psychological Operation" [基于视 频的心理暗示作战机理研究], *Journal of the Academy of Equipment Command and Technology* [装备指挥技术学 院学报], Vol. 22, No. 4, August 2011.

Buckley, Chris, "Vows of Change in China Belie Private Warning," *New York Times*, February 14, 2013a.

Buckley, Chris, "Crackdown on Bloggers Is Mounted by China," *New York Times*, September 10, 2013b.

Buckley, Chris, and Steven Lee Myers, "In Turbulent Times, Xi Builds a Security Fortress for China, and Himself," *New York Times*, August 6, 2022.

Butler, Zak, "Google Disrupted Over 10,000 Instances of DRAGONBRIDGE Activity in Q1 2024," Google, June 26, 2024.

Cadell, Cate, “China Harvests Masses of Data on Western Targets, Documents Show,” *Washington Post*, December 31, 2021.

Cai Lei [蔡磊], Meng Xianbo [孟宪波], Han Dongmei [韩冬梅], and Xiao Zhenhua [肖振华], “Applications of Large-Scale Models in the Military Vertical Domain” [“大模型在军事垂直领域的应用”], *Ship Science and Technology* [舰船科学技术], Vol. 46, No. 5, June 2024.

Cai Xinyu [蔡新宇], “‘Applied Statistics and Data Science Forum’ Was Held in Our School” [“‘应用统计与数据科学论坛’在我校举办”], Huaqiao University [华侨大学], July 16, 2019. September 28, 2023: ‘https://www.hqu.edu.cn/info/1071/85606.htm

Carter, Liz, *Let 100 Voices Speak: How the Internet Is Transforming China and Changing Everything*, I.B. Tauris, 2015.

Cay, Yusuf, “GPT-4 Test Scores: Performance Against Humans,” *ChatGPT Blog*, July 25, 2023. As of September 28, 2023: https://chatgptplus.blog/gpt4-test-scores/#:~:text=For%20instance%2C%20in%20the%20AI2,only%20managed%20to%20score%2048.1%25 and https://huggingface.co/spaces/HuggingFaceH4/open_llm_leaderboard

Center for Strategic Translation, “Great Changes Unseen in a Century,” 2022. As of September 27, 2023: https://www.strategictranslation.org/glossary/great-changes-unseen-in-a-century

“Chairman Xi Inspected the PLA Daily Press, Wished Officers and Troops Happy New Year” [“习主席视察解放军报社向广大官兵祝贺新年”], *China Military Online* [中国军网], December 25, 2015.

Chandra, Bilva, and Lev Navarre Chao, “Dismantling the Disinformation Business of Chinese Influence Operations,” *RAND blog*, October 17, 2023. As of August 16, 2024: https://www.rand.org/pubs/commentary/2023/10/dismantling-the-disinformation-business-of-chinese.html

Charon, Paul, and Jean-Baptiste Jeangène Vilmer, *Chinese Influence Operations: A Machiavellian Moment*, Institute for Strategic Research, October 2021. As of August 12, 2024: https://www.irsem.fr/report.html

Che, Chang, and Olivia Wang, “What Happens When You Ask a Chinese Chatbot About Taiwan?” *New York Times*, July 14, 2023.

Chen, Celia, and Meng Jing, "What You Need to Know About Meiya Pico, China's Low-Profile Forensics Champion Named in Data Privacy Scandal," *South China Morning Post*, July 9, 2019.

Chen Changxiao [陈昌孝], Li Hao [李浩], and Chao Shuai [晁帅], "An Exploration of the Efficacy Mechanism and Key Technologies of Algorithmic Cognitive Warfare" ["算法认知战的致效机理与关键技术探析"], *Information Security and Communications Privacy* [信息安全与通信保密], December 2023.

Chen Danwen [陈丹雯], "Research on Text-Driven Virtual News Generation Technology" ["基于文本驱动的虚拟新闻生成技术研究"], master's thesis, National University of Defense Technology [国防科学技术大学], 2006.

Chen Hua [陈华], "Seize the Initiative in the Online Public Opinion Struggle" ["夺取网络舆论斗争的主动权"], *PLA Daily*, September 4, 2013.

Chen, John, "China's Cyber Capabilities: Warfare, Espionage, and Implications for the United States," hearing, testimony before the U.S.-China Economic and Security Review Commission, February 17, 2022.

Chen Qian [陈茜] and Yu Yuanlai [余远来], "Research on Guiding International Public Opinion About China from the Perspective of Computational Propaganda" ["计算宣传视角下涉华国际舆情引导研究"], *Military Correspondent* [军事记者], May 2022.

Chen, Stephen, "China's Internet Police Losing Man-Versus-Machine Duel on Social Media," *South China Morning Post*, November 14, 2021.

Chen Qingbao [陈庆宝], "Analysis on the U.S. 'Online Botnets' and Research on Countermeasures" ["对美国 '网络水军' 的分析及对策研究"], *Military Correspondent* [军事记者], December 2012.

Chen, Stephen, "China's Military Lab AI Connects to Commercial Large Language Models for the First Time to Learn More About Humans," *South China Morning Post*, January 12, 2024.

Chen Ting [陈廷], "Political Security Risks of Artificial Intelligence and Our Prevention and Control Countermeasures" ["人工智能的政治安全风险及其放空对策"], *China Military Science* [中国军事科学], October 2019.

Chen Yue [陈岳] and Ding Zhangchun [丁章春], "Discourse Power in Sino-Western Relations" [中西关系里的话语权], *People's Daily*, January 18, 2017. September 28, 2023: http://theory.people.com.cn/n1/2017/0117/c352499-29030509.html

Chi Sun, Luyao Huang, and Xipeng Qiu, "Utilizing BERT for Aspect-Based Sentiment Analysis via Constructing Auxiliary Sentence," paper, March 22, 2019.

Chien Li-chung, Chung Li-hua, and Jonathan Chin, "China Using Fake News to Divide Taiwan," *Taipei Times*, September 16, 2018.

Chin, Josh, "Weibo Watershed? Train Collision Anger Explodes Online," *Wall Street Journal*, July 26, 2011.

Chin, Josh, and Paul Mozur, "China Intensifies Social-Media Crackdown," *Wall Street Journal*, September 19, 2013.

China Media Project, "Telling China's Story Well," April 16, 2021."China News Service Holds Mid-Year Work Meeting, Tan Tianxing Puts Forward Four Requirements" ["中国新闻社召开年中工作会 谭天星提四点要求"], China News Service, August 6, 2018.

"China Now Has Over 180 LLMs Approved for General Use," TechNode, August 13, 2024.

"China's Propaganda Machine Is Spending Over $1 Million to Buy Influence on Foreign Social Media," Quartz, August 21, 2019.

Chinascope, "Silent Contest," China Scope, March 5, 2014.

"Chinese Internet Giants Speed Up Development of AI to Tap Vast Market," *Global Times*, April 17, 2024.

"Chinese Large Model Benchmark Evaluation 2023 Annual Report" ["中文大模型基准测评 2023 年度报告"], SuperCLUE, December 31, 2023.

Chung Li-hua and William Hetherington, "China Targets Polls with Fake Accounts," *Taipei Times*, November 5, 2018.

Chung Li-hua and Jonathan Chin, "China Could Use AI to Meddle in Polls," *Taipei Times*, June 24, 2023.

"Closing Time? China's Social Media Crackdown Has Hit Weibo Hard," Tea Leaf Nation, January 31, 2014.

Confessore, Nicholas, Gabriel J. X. Dance, Richard Harris, and Mark Hansen, "The Follower Factory," New York Times, January 27, 2018.

Conger, Kate, "Facebook and Twitter Say China Is Spreading Disinformation in Hong Kong," *New York Times*, August 19, 2019.

Creemers, Rogier, "Cyber China: Upgrading Propaganda, Public Opinion Work and Social Management for the Twenty-First Century," *Journal of Contemporary China*, Vol. 26, No. 103, 2016.

Creemers, Rogier, Paul Triolo, and Graham Webster, "Translation: China's New Top Internet Official Lays Out Agenda for Party Control Online," New America, September 24, 2018.

Creemers, Rogier, Paul Triolo, and Graham Webster, "Translation: Xi Jinping's April 20 Speech at the National Cybersecurity and Informatization Work Conference," New America, April 30, 2018.

Custer, Charlie, "The Wenzhou Crash and the Future of Weibo," *Tech in Asia*, August 1, 2011.

Cyberspace Administration of China Theoretical Studies Center Group [中央网信办理论学习中心组], "Deepening the Implementation of General Secretary Xi Jinping's Strategic Thinking on Building China into a Cyber Superpower: Steadily Advancing Cybersecurity and Informatization Work" ["深入贯彻习近平总书记网络强国战略思想 扎实推进网络安全和信息化工作"], *Seeking Truth*, September 15, 2017.

"Decision of the Central Committee of the Communist Party of China on Several Major Issues Concerning Comprehensively Deepening Reform" ["中共中央关于全面深化改革若干重大问题的决定"], Xinhua, November 15, 2013.

Dahm, J. Michael, "A Disturbance in the Force: The Reorganization of People's Liberation Army Strategic Support Force," *China Brief*, April 26, 2024.

deLisle, Jacques, Avery Goldstein, and Guobin Yang, eds., *The Internet, Social Media, and a Changing China*, University of Pennsylvania Press, 2016.

Ding Cheng [丁成], Li Xiaoyan [李晓燕], and Cao Guanping [曹冠平], "How to Take Advantage of Military-Civil Fusion Development Opportunities to Do a Good Job in the Construction of Psychological Warfare in Reserve Forces" ["如何利用军民融合式发展机遇抓好预备役部队心理战建设"], *Intelligence* [才智], 2015.

Ding, Jeffrey, "ChinAI #231: Latest SuperCLUE Rankings of Large Language Models," ChinAI, July 31, 2023.

"Disrupting Malicious Uses of AI by State-Affiliated Threat Actors," OpenAI, February 14, 2024a.

"Document 9: A ChinaFile Translation," ChinaFile, November 8, 2013.

Doshi, Rush, "'Great Changes Unseen in a Century': The Elusive Phrase Driving China's Grand Strategy," *China Leadership Monitor*, Summer 2021.

Doshi, Rush, *The Long Game: China's Grand Strategy to Displace American Order*, Oxford University Press, 2021.

Dotson, John, "Chinese Covert Social Media Propaganda and Disinformation Related to Hong Kong," *China Brief*, Vol. 19, No. 16, September 6, 2019.

Druckman, James N., Erik Peterson, and Rune Slothuus, "How Elite Partisan Polarization Affects Public Opinion Formation," *American Political Science Review*, Vol. 107, No. 1, 2013.

Duan Wenling [段文灵], Liu Jiali [刘甲立], "Cognitive Confrontation on the Social Media Battlefield" ["社交媒体战场上的认知对抗"], *PLA Daily*, February 2, 2023. As of September 29, 2023: http://www.81.cn/jfjbmap/content/2023-02/02/content_332813.htm

"During the 12th Collective Study of the Political Bureau of the CCP Central Committee, Xi Jinping Emphasized Promoting In-Depth Development of Media Integration and Consolidating the Common Ideological Foundation of the Whole Party and the People of the Country" ["习近平在中共中央政治局第十二次集体学习时强调 推动媒体融合向 纵深发展 巩固全党全国人民共同思想基础"], Xinhua, January 25, 2019.

Editorial Department [本刊编辑部], "Provide Strong Public Opinion Support for Building a World-Class Military—Conscientiously Study, Publicize and Implement the Spirit of the 20th National Congress of the Party" ["为建成世界一流军队提供有力舆论支持: 认真学习宣传贯彻党的二十大精神"], *Military Correspondent* [军事记者], June 2022.

Erickson, Andrew, *Chinese Anti-Ship Ballistic Missile (ASBM) Development: Drivers, Trajectories, and Strategic Implications*, Jamestown Foundation, 2013.

"Foreign Threats to the 2020 US Federal Elections," National Intelligence Council, March 10, 2021, declassified on March 10, 2021.

Feng, Coco, "Chinese Entrepreneurs Express Awe and Fear of OpenAI's Sora Text-to-Video Generator, as US Sanctions Weigh on AI Race," *South China Morning Post*, February 20, 2024.

Feng, Coco, and Ben Jiang, "OpenAI's Sora Pours 'Cold Water' on China's AI Dreams, as Text-to-video Advancements Prompt More Soul-Searching," *South China Morning Post*, February 24, 2024.

Feng Haonan [冯皓楠], He Zhiyong [何智勇], and Ma Liangli [马良荔], "Multimodal Label Recommendation Based on Text-Enhanced Coattention Mechanism" ["基于文本增强的共注意机制的多模态标签推荐"], *Journal of Shaanxi Normal University (Natural Science Edition)* [陕西师范大学学报(自然科学版)], 2023.

Fielding, Nick, and Ian Cobain, "Revealed: U.S. Spy Operation that Manipulates Social Media," *The Guardian*, March 17, 2011.

Finkelstein, David M., *The PLA's New Joint Doctrine The Capstone of the New Era Operations Regulations System*, CNA Corporation, September 2021.

Franceschi-Bicchierai, Lorenzo, “Hackers Leak Alleged Internal Files of Chinese Social Media Monitoring Firms,” *Vice*, August 21, 2020.

Franklin, Margarita, Lindsay Hundley, Mike Torrey, David Agranovich, and Mike Dvilyanski, “Adversarial Threat Report,” Meta, May 2024.

Fravel, Taylor, *Active Defense: China’s Military Strategy Since 1949*, Princeton University Press, 2019.

Freedberg, Sydney J., “Deepfakes Deepfail: Russian Propagandists Turn Away from Generative AI,” Breaking Defense, September 5, 2024.

Friedman, Toni, “Lexicon: ‘Discourse Power’ or the ‘Right to Speak’ (话语权, Huàyǔ Quán),” DigiChina, March 17, 2022.

Fu Bo [傅波], “The U.S. Military Uses Social Media to Conduct Information Warfare” [“美军利用社交媒体开展信息战”], *China Defense News*, October 10, 2022.

“Full Text of Xi Jinping’s Report at 19th CPC National Congress,” Xinhua, November 3, 2017.

Gan, Nectar, and Selina Wang, “A Sense of Crisis Has Defined Xi’s Rule. It Will Shape China Well into the Future,” CNN, October 14, 2022.

Gao, Helen, “Rumor, Lies and Weibo: How Social Media Is Changing the Nature of Truth in China,” *The Atlantic*, April 16, 2012.

Gao Qingning [高庆宁], “Analysis and Simulation of Group Behavior in the Evolution of Online Public Opinion Based on SOAR Model” [“基于 SOAR 模型的网络舆情演变过程中群体行为分析与仿真”], master’s thesis, Nanjing University of Science & Technology [南京理工大学], 2016.

Gao Zhenguo [高振国] and Chen Yan [陈岩], “Relying on the Construction of Our School, the Fujian Provincial Key Laboratory of Computer Vision and Machine Learning Established an Academic Committee and Held Its First Meeting” [“依托我校建设 计算机视觉与机器学习福建省高校重点实验室成立学术委员会并召开第一次会议”], Huaqiao University [华侨大学], October 2, 2021. As of September 28, 2023: https://www.hqu.edu.cn/info/1067/92922.htm

Gao Zhenguo [高振国] and Chen Yan [陈岩], “The Academic Committee of the Fujian Provincial Key Laboratory of Universities in Computer Vision and Machine Learning Was Established and the First Academic Committee Meeting Was Held” [“计算机视觉与机器学习福建省高校重点实验室学术委员会成立 第一次学术委员会会议召开”], Huaqiao University [华侨大学], October 2, 2021. As of September 28, 2023: https://www.hqu.edu.cn/info/1071/92916.htm

"General Secretary Xi Jinping's Important Speech at the Party's Press and Public Opinion Work Symposium Aroused Strong Response" ["习近平总书记在党的新闻舆论工作座谈会上的重要讲话引起强烈反响"], Xinhua, February 20, 2016.

Geng Lei [耿磊], "Build a Strategic Communication System with Clear Chinese Characteristics" ["构建具有鲜明中国特色的战略传播体系"], *Military Correspondent*, May 31, 2021. As of September 25, 2023: http://www.81.cn/jsjz/2021-12/17/content_10115897.htm

Global Engagement Center, *How the People's Republic of China Seeks to Reshape the Global Information Environment*, U.S. Department of State, September 2023.

Graphika, *Deepfake It Till You Make It: Pro-Chinese Actors Promote AI-Generated Video Footage of Fictitious People in Online Influence Operation*, February 2023.

Graphika, *The #Americans: Chinese State-Linked Influence Operation Spamouflage Masquerades as U.S. Votes to Push Divisive Narratives Ahead of 2024 Election*, September 2024.

Graphika and the Stanford Internet Observatory Cyber Policy Center, *Unheard Voice: Evaluating Five Years of Pro-Western Covert Influence Operations*, August 2022.

Griffiths, James, "Weibo's Free-Speech Failure," *The Atlantic*, March 20, 2019.

Grundy, Tom, "Did China's State-Run News Agency Purchase Twitter Followers?" *Hong Kong Free Press*, April 14, 2015.

Guo Hongbin [郭红斌], "Main Characteristics of Online Public Opinion War" ["网络舆论战的主要特征"], *Military Correspondent* [军事记者], September 2009.

Guo Xiaodong [郭晓东], "End-to-End Chinese Crowd-Turfing Attack and Defense Method" ["端到端的中文评论众包攻击与防御方法"], master's thesis, Wuhan University, 2020.

Guo Xiaohang [郭晓航], "Challenges and Countermeasures of College Students' Ideological and Political Education from the Perspective of Online Public Opinion" ["网络舆论视角下大学生思想政治教育的挑战及对策"], *Journal of Chongqing University of Science and Technology (Social Sciences)* [重庆理工大学学报(社会科学)], Vol. 36, No. 5, 2022.

Guo Xiaoyi [郭小一], Lao Songyang [老松杨], and Wu Xiaoxi [吴晓曦], "Research on Psychological Warfare Video Information Product Development Systems" ["心理战视频信息产品开发系统研究"], *Military Operations and Systems Engineering* [军 事运筹与系统工程], Vol. 24, No. 2, June 2010.

Guo Xiaoyi [郭小一], Lao Songyang [老松杨], and Zhang Guohua [张国华], "Information Producing of Psychological Suggestion Based on Video Superimposing" ["基于视频叠加的心理暗示"], *Systems Engineering—Theory and Practice* [系统工程理论与实践], Vol. 32, No. 2, February 2012.

Guo Yunfei [郭云飞], "Cognitive Domain Operations Enter the Era of Seizing Command of the Mind" ["认知域 作战进入制脑权争夺时代"], *PLA Daily*, June 2, 2020.

Ha Da [哈达], Tan Zhiguo [谭志国], and Wang Hao [王浩], "Research on Agent-Based Public Opinion Evolution Under Complex Networks" ["复杂网络下基于 Agent 的舆情演化研究"], Firepower Command and Control [火力与指挥控制], Vol. 42, No. 8, August 2017.

Harold, Scott W., Nathan Beauchamp-Mustafaga, and Jeffrey W. Hornung, *Chinese Disinformation Efforts on Social Media*, RAND Corporation, RR-4373/3-AF, 2021. As of August 16, 2024: https://www.rand.org/pubs/research_reports/RR4373z3.html

Hass, Ryan, and Colin Kahl, "Laying the Groundwork for US-China AI Dialogue," Brookings Institution, April 5, 2024.

Heikkilä, Melissa, "OpenAI's Hunger for Data Is Coming Back to Bite It," *MIT Technology Review*, April 19, 2023.

He Yu [何宇], Zhang Hua [张化], "Winning Mechanism and Advanced Technology of 'Cognitive lntelligent Operation,'" ["认知智能作战"制胜机理及前沿技术"], *National Defense Technology* [国防科技], January 2023.

He Yucheng [何玉诚], "The Research of the Control of Negative Public Opinion During War Time" ["战时不利舆论信息管控研究"], master's thesis, National University of Defense Technology [国防科学技术大学], November 2010.

Hoffman, Samantha, *Engineering Global Consent: The Chinese Communist Party's Data-Driven Power Expansion*, Australia Policy Research Institute, 2019.

Hoffman, Samantha, and Nathan Attrill, *Mapping China's Tech Giants: Supply Chains & the Global Data Collection Ecosystem*, Australian Strategic Policy Institute, June 2021.

Hoffman, Samantha, Hoffman, Tilla Hoja, Yvonne Lau, and Lilly Min-Chen Lee, *Truth and Reality with Chinese Characteristics*, Australian Strategic Policy Institute, May 2024.

Hornby, Lucy, "China Blocks Twitter Service Ahead of Anniversary," Reuters, June 2, 2009.

Hosseini-Asl, Ehsan, Wenhao Liu, Caiming Xiong, "A Generative Language Model for Few-Shot Aspect-Based Sentiment Analysis," paper, April 11, 2022.

Hou Dawei [侯大伟], "Analysis on Improving the Quality and Effectiveness of Public Opinion Work in the All-Media Era" ["提高全媒体时代舆情工作质效论析"], *Military Correspondent* [军事记者], January 2023.

Hou Xia [侯霞], "Analysis of the United States Information Warfare Against Russia in 2022 Russia-Ukraine Conflict" ["俄乌冲突中美国对俄信息战分析"], *Journal of Intelligence* [情报杂志], Vol. 42, No. 6, 2023.

Hu Shengwei [胡盛伟], "Research on Conditional Text Generation Technology and Its Application based on Deep Learning" ["基于深度学习的条件文本生成技术与应用研究"], master's thesis, Huaqiao University [华侨大学], April 2020.

Hu Shengwei [胡盛伟], Li Bicheng [李弼程], Lin Kongjie [林孔杰], and Xiong Yao [熊尧], "MaskAE: Unsupervised Short Text Sentiment Transfer Method" ["MaskAE: 基于无监督的短文本情感迁移方法"], *Journal of Chinese Information Processing* [中文信息学报], Vol. 34, No. 2, February 2020.

Hua Chunying [华春莹], "Occupy the Moral High Ground and Enhance International Discourse Power" ["占据道义制高点，提升国际话语权"], *Study Times* [学习时报], July 12, 2019, translation via Zhang et al., "Behind China's Twitter Campaign, a Murky Supporting Chorus," *New York Times*, June 8, 2020.

Huang, Cary, and Keith Zhai, "Xi Jinping Rallies Party for Propaganda War on Internet," *South China Morning Post*, September 4, 2013.

Huang Kaijie [黄恺杰], Wang Jian [王剑], and Chen Jiongyi [陈炯峄], "A Large Language Model Based SQL Injection Attack Detection Method ["一种基于大语言模型的 SQL 注入攻击检测方法"], *NetInfo Security* [信息网络安全], November 2023.

Huang, Paul, "Chinese Cyber-Operatives Boosted Taiwan's Insurgent Candidate," *Foreign Policy*, June 26, 2019.

Huang Peng [黄鹏], Hua Honghu [华宏虎], and Wang Hao [王皓], "Psychological Warfare Effectiveness Evaluation Based on Big Data" [大数据视角下的心 理战效果评估], *National Defense Technology* [国防科技], Vol. 40, No. 4, April 2019.

Huang Yangkun and Chen Changfeng. "Automation of Visual Communication and aesthetic Construction of National Image: A Computational Aesthetic Analysis of Social Bots on Twitter," *Online Media and Global Communication*, Vol. 3, No. 1, 2024.

Huaqiao University [华侨大学], "Introduction to Huaqiao University" ["华侨大学简介"], webpage, undated-a.

Huaqiao University [华侨大学], “Li Bicheng” [“李弼程”], webpage, undated-b. As of September 28, 2023:
https://faculty.hqu.edu.cn/LBC1

Huaqiao University [华侨大学], “Overview” [“华大概况”], webpage, undated-c. As of September 28, 2023:
https://www.hqu.edu.cn/hdgk/xxjj.htm

Huaqiao University [华侨大学], “Teaching Staff” [“师资队伍”], webpage, undated-d. As of September 28, 2023:
https://cst.hqu.edu.cn/szdw/jxky1/azc/js.htm

Huaqiao University [华侨大学], “Our Institute Participated in the Preparatory Meeting for the Special Docking Work of Fujian Province’s Military-Civil Fusion Project” [“我院参加福建省军民融合项目专场对接工作筹备会”], webpage, March 1, 2018. As of September 28, 2023:
https://xmgyy.hqu.edu.cn/info/1059/9010.htm

Huaqiao University [华侨大学], “Xiamen Ansheng Network Technology Co., Ltd. (a Subsidiary of Meiya Pico) Recruitment Brochure” [“厦门安胜网络科技有限公司 (美亚柏科子公司) 招聘简章”], webpage, October 22, 2020. As of September 28, 2023:
https://cst.hqu.edu.cn/info/1062/2753.htm

Huaqiao University [华侨大学], “A Delegation from the Provincial Party Committee’s Military-CivilFusion Office Came to the School for Investigation” [“省委军民融合办一行来校调研”], webpage, March 1, 2023. As of September 28, 2023:
https://xmgyy.hqu.edu.cn/info/1059/14028.htm

Hudson, John, “Was China’s Politburo Behind the Google Cyber Attacks?” *The Atlantic*, November 29, 2010.

Hua Rui [华瑞], Yang Longxiao [杨龙霄], and Yang Runxin [杨润鑫], “When Generative Artificial Intelligence Heads to the Battlefield” [“当生成式人工智能走向战场”], *PLA Daily*, December 1, 2023.

Hunan University of Humanities, Science and Technology [湖南人文科技学院], “Social Work Discipline 14th Five-Year Construction and Development Plan (2021–2025)” [“社会工作学科十四五建设发展规划（2021–2025)”], webpage, June 24, 2021. As of September 28, 2023:
http://www.huhst.edu.cn/fxy/info/1237/8355.htm

Hurst, Daniel, Lily Kuo, and Charlotte Graham-McLay, "Zhenhua Data Leak: Personal Details of Millions Around World Gathered by China Tech Company," *The Guardian*, September 14, 2020.

IEEE Xplore, "Author Profile: Li Bicheng," webpage, undated. As of September 28, 2023: https://ieeexplore.ieee.org/author/37087290027

Jacobs, Andrew, "It's Another Perfect Day in Tibet," *New York Times*, July 22, 2014.

Ji Chenjie [季陈杰] and Liu Wei [刘威], "A Brief Exploration of Online Public Opinion Warfare" ["网络舆论战浅探"], *Military Correspondent* [军事记者], January 2009.

Jiang Yuncang [姜运仓], "Characteristics and Responses of the West's Public Opinion War Against China Under the New Situation" ["新形势下西方对华舆论战的特点及应对"], *Journal of Zhengzhou Aviation Industry Management Institute (Social Science Edition)* [郑州航空工业管理学院学报(社会科学版)], Vol. 37, No. 1, 2018.

Jiangsu Think Tank [江苏智库], "International Communication Capacity Building of Chinese Language Think Tanks" ["中国语言智库的国际传播能力建设"], webpage, October 20, 2022. As of September 29, 2023: http://www.jsthinktank.com/wap/zhikuyanjiu/202210/t20221020_7730209.shtml

Jin Weihua [金卫华], "Focus on Winning the War and Giving Full Play to the Lifeline Role of Political Work" ["聚焦能打胜仗充分发挥政治工作生命线作用"], *Theoretical Studies on PLA Political Work* [军队政工理论研究], Vol. 15, No. 2, April 2014

Jirouš, Filip, and Petra Ševčíková, "Covert Propaganda Operations in Plain Sight: The CCP United Front System's Media Network in Europe," Sinopsis, July 2021.

Joske, Alex, *Picking Flowers, Making Honey: The Chinese Military's Collaboration With Foreign Universities*, Australian Strategic Policy Institute, October 2018. As of September 28, 2023: https://www.aspi.org.au/report/picking-flowers-making-honey

Joske, Alex, *The Party Speaks for You: Foreign Interference and the Chinese Communist Party's United Front System*, Australian Strategic Policy Institute, June 9, 2020. As of September 28, 2023: https://www.aspi.org.au/report/party-speaks-you

Jun Sheng [钧声], "Political Manipulation and Disregard for Life Have Led to the Spread of the Pandemic" ["政治操弄，漠视生命导致疫情泛滥"], *PLA Daily* [解放军报], September 24, 2022.

Kaiman, Jonathan, “Free Tibet Exposes Fake Twitter Accounts by China Propagandists,” *The Guardian*, July 22, 2014.

Kamphausen, Roy, ed., *The People of the PLA 2.0*, National Bureau of Asian Research, 2021.

Kang Zhiyong [康智勇], Li Bicheng [李弼程], and Lin Huang [林煌], “User Interest Recognition Method Incorporating Category Labels and Topic Information” [“融入类别标签和主题信息的用户兴趣识别方法”], *Computer Science* [计算机科学], 2024.

Kania, Elsa, “Artificial Intelligence in Future Chinese Command Decision Making,” in Nicholas D. Wright, ed., *Artificial Intelligence, China, Russia, and the Global Order*, Air University Press, 2019.

Kania, Elsa, “The Party’s ‘Hurdles’: the Internet, Propaganda, and Power,” *The Diplomat*, September 27, 2017.

Kania, Elsa, Samm Sacks, Paul Triolo, and Graham Webster, “China’s Strategic Thinking on Building Power in Cyberspace,” New America, September 25, 2017.

Kao, Jeff, and Mia Shuang Li, “How China Built a Twitter Propaganda Machine Then Let It Loose on Coronavirus,” ProPublica, March 26, 2020.

Kao, Jeff, Raymond Zhong, Paul Mozur, Aliza Aufrichtig, Nailah Morgan, and Aaron Krolik, “‘We Are Very Free’: How China Spreads Its Propaganda Version of Life in Xinjiang,” *New York Times*, June 22, 2021.

Keast, Jacinta, *Shadow Play: A Pro-China Technology and Anti-US Influence Operation Thrives on YouTube*, Australian Strategic Policy Institute, 2023.

Kinetz, Erika, “Anatomy of a Conspiracy: With COVID, China Took Leading Role,” Associated Press, February 15, 2021.

Kinetz, Erika, “Army of Fake Fans Boosts China’s Messaging on Twitter,” Associated Press, May 28, 2021.

King, Gary, Jennifer Pan, and Margaret E. Roberts, “How the Chinese Government Fabricates Social Media Posts for Strategic Distraction, Not Engaged Argument,” *American Political Science Review*, Vol. 111, No. 3, 2017.

Kivlehan-Wise, Maryanne, “Military Political Work at the CCP’s Centennial,” *China Brief*, Vol. 21, No. 12, June 18, 2021. As of September 28, 2023: https://jamestown.org/program/military-political-work-at-the-ccps-centennial

Krebs, Bryan, “Twitter Bots Target Tibetan Protests,” Krebs on Security, March 20, 2012.

Kuang Dazhen [匡大镇] and Hong Wenjun [洪文军], “The Military and Civilians Work Together to Promote the Innovative Development of Military Online Public Opinion Work” [“军地携手推进军队网络舆论工作创新发展”], *PLA Daily*, June 28, 2016.

Lakshmanan, Indira A. R., “Leaders in Beijing Feared Arab Spring Could Infect China,” Bloomberg, May 1, 2012.

Lai Dongwei [赖东威], “An Analysis of the Minnan Language Sentence Patterns and Vocabulary Used on Taiwanese Social Media” [“台湾社交媒体的闽南语句式和词汇使用现象探析”], *News Research* [新闻研究], November 2017.

Lan Zhouda [兰舟达] and Ma Jianguang [马建光], “New Cyber Warfare from the Perspective of Command of the Mind: Taking the Color Revolutions as an Example” [“制脑权视 野下的新型网络战: 以颜色革命为例”], *National Defense Technology* [国防科技], April 2015.

Leonard, Jenny, and Nick Wadhams, “U.S. Weighs Blacklisting Five Chinese Video Surveillance Firms,” Bloomberg, May 21, 2019.

Li Bicheng [李弼程], *Online Public Opinion Analysis: Theory, Technology, and Strategy* [网络舆情分析: 理论, 技术与应对策略], National Defense Industry Press [国防工业出版社], 2015.

Li Bicheng [李弼程], “Model for a System of Online Public Opinion Struggle and Countermeasures” [“网络舆论斗争系统模型与应对策略”], *National Defense Technology* [国防科技], October 2016.

Li Bicheng [李弼程], “A Brief Introduction of All Domain Integrated Joint Operations for Online Public Opinion Struggle” [“网络舆论斗争的全域一体联合作战”], *National Defense Technology* [国防科技], April 2017.

Li Bicheng [李弼程], Chen Zhibin [陈志彬], Kang Zhiyong [康智勇], Pi Huijuan [皮慧娟], Wang Huazhen [王华珍], and Wang Cheng [王成], “Social Network User Cognitive Vulnerability Analysis Method and Device Based on Fuzzy Comprehensive Judgment Technology” [“基于模糊综合评判技术的社交网络用户认知脆弱性分析方法及装置”], Chinese patent number CN118536610A, filed May 23, 2024.

Li Bicheng [李弼程] and Gong Zhenkai [龚振凯], “Affective Text Generation with Hard Constraints” [“硬约束限制的情感文本生成方法研究”], *Application Research of Computers* [计算机应用研究], January 2023.

Li Bicheng [李弼程] and Guo Lei [郭磊], “Cognitive Mechanism Analysis of Online Public Opinion” [“网络舆情认知机理分析”], *National Defense Technology* [国防科技], Vol. 40, No. 1, February 2019.

Li Bicheng [李弼程], Hu Huaping [胡华平], and Xiong Yao [熊尧], “Intelligent Agent Model for Online Public Opinion Guidance” [“网络舆情引导智能代理模型”], *National Defense Technology* [国防科技], June 2019.

Li Bicheng, Huang Jie, and Yin Hujun, “A General Fuzzy Modeling Approach to Detection Decision Fusion,” 2009 Fourth International Conference on Frontier of Computer Science and Technology, Shanghai, China, 2009a.

Li Bicheng, Huang Jie, and Yin Hujun, “Two Efficient Combination Rules for Conflicting Belief Functions,” 2009 International Conference on Artificial Intelligence and Computational Intelligence, Shanghai, China, 2009b.

Li Bicheng [李弼程], Lin Chen [林琛], and Guo Zhigang [郭志刚], “Discussion About Research for Internet’s Public Opinion of Sudden Events” [“突发事件网络舆情研究探讨”], *Journal of Intelligence* [情报杂志], Vol. 29, No. 7, July 2010.

Li Bicheng [李弼程], Lin Chen [林琛], and Zhou Jie [周杰], “Research on the Patterns of Online Public Opinions About the State and Trend Analysis” [“网络舆情态势分析模式研究”], *Information Science* [情报科学], Vol. 28, No. 7, July 2010.

Li Bicheng [李弼程], Wang Yun [王允], Lin Chen [林琛], Guo Zhigang [郭志刚], and Yan Hongcan [阎红灿], “Web Forum Information Extraction System” [“一种 Web 论坛信息抽取系统”], Chinese patent number CN101727486A, granted June 9, 2010.

Li Bicheng [李弼程], Xiong Yao [熊尧], Huang Tao [黄涛], and Pan Le [潘乐], “Simulation Deduction Model and System Construction for Intelligent Online Public Opinion Guidance” [“网络舆论智能引导仿真推演模型与系统构建”], *National Defense Technology* [国防科技], October 2020.

Li Bicheng and Yin Hujun, “Face Recognition Using RBF Neural Networks and Wavelet Transform,” in Jun Wang, Xiao-Feng Liao, and Zhang Yi, *Advances in Neural Networks*, Springer, 2005.

Li Bicheng [李弼程], Zhou Jie [周杰], Lin Chen [林琛], Chen Gang [陈刚], and Li Zhen [李真], “Network Criticism Oriented Viewpoint Subject Identifying Method and System” [“一种面向网络评论的观点主题识别方法和系统”], Chinese patent number CN101727487A, granted June 9, 2010.

Li Congjun [李从军], “Firmly Grasping the Initiative in Public Opinion Work” [“牢牢掌握舆论工作主动权”], *People’s Daily*, September 4, 2013.

Li Hongqian [李洪乾], Liang Xiaobo [梁晓波], “The Problems of China’s Defense Language Education Program and Their Countermeasures” [“语言战略化背景下的我国国防语言教育现状及策略研究”], *Journal of Yunmeng* [云梦学刊], Vol. 39, No. 2, 2018.

Li Jiahong [李佳泓], Huang Jia [黄嘉], and Gu Juxian [古炬贤], “Research on the Issues of Infiltration of Values in Natural Language Processing: Taking ChatGPT as an Example” [“自然语言处理中的价值观渗透问题: 以 ChatGPT 为例 认领”], *Journal of Intelligence* [情报杂志], August 2024.

Li Jidong [李继东] and Chen Zhou [陈舟], “On Strategic Cyber Warfare” [“试论战略网络战”], *China Military Science* [中国军事科学], December 2017.

Li Jun [李俊], “Research on Online Public Opinion Warfare” [“网络舆论战研究’”], master’s thesis, PLA National Defense University of Technology [国防科技大学], 2005.

Li Liuying [李留英], Sun Yixiang [孙亦祥], “Research on Military Information Content Security Driven by Threat Intelligence” [“威胁情报驱动的军事信息内容安全研究”], *Network Security Technology and Applications* [网络安全技术与应用], No. 3, 2022.

Li Manxiang [李满想], “Analysis on Inspiring the Fighting Spirit of Our Army from the Perspective of Intelligence” [“智能化视域下我军战斗精神激发探析”], *Journal of Political Work* [政工学刊], No. 2, February 2022.

Li Mo [李沫], “Strategic Communication: The Battle for the Frontier of National Interests” [“战略传播：国家利益争夺前沿的较量”], *China National Defense* [中国国防报], December 8, 2016.

Li Qiang [李强], Wang Feiyue [王飞跃], “A Framework and Key Issues of Parallel Social Warfare Systems for Contemporary Mixed Wars and Military Operations Other Than Wars” [“‘三战合一’下的平行智能‘观战’系统架构及核心关键技术研究], *Military Operations Research and Systems Engineering* [军事运筹与系统工程], Vol. 33, No. 4, 2019.

Li Qiang [李强], Yang Dongsheng [阳东升], Sun Jiangsheng [孙江生], “Social Cognition Operations: Backgrounds, Concepts, Mechanisms and Leading Technologies” [“社会认知战: 时代背景, 概念机理及引领性技术”], *Journal of Command and Control* [指挥与控制学报], 2021.

Li, Shan, and Philip Wen, “This App Helps You Learn About China, While China Learns All About You,” *Wall Street Journal*, October 14, 2019.

Li Xiaoguang [李小光] and Zhou Shaozhen [周守珍], “Analysis on the Operational Mechanism of Psychological Warfare in Reserve Forces” [预备役 部队心理战运行机制探析], South China National Defense Medical Journal [华南国防医学杂志], Vol. 28, No. 5, 2014.

Li Xinwei [李欣烤], “High-Resolution Multi-Object Scene Image Generation Technology Based on Generative Adversarial Network” [“基于生成对抗网络的高分辨率多目标场景图像生成技术”], master’s thesis, National Defense University of Technology [国防科技大学], 2021.

Li Xiubao [李秀宝], “Be a Pioneer in the In-Depth Development of Military Media Integration” [“做军事媒体融合向纵深发展的开拓者”], *Military Correspondent* [军事记者], March 2019.

Li Yuan, “Why China Didn’t Invent ChatGPT,” *New York Times*, February 17, 2023.

Li Yutian [李雨田] and Zhang Maolin [张茂林], “The Era of Intelligent Media: The Application of Social Bots in Cognitive Domain Confrontation and its Enlightenment” [“智媒时代: 社交机器人在认知域对抗中的运用及启示”], *Artificial Intelligence Security* [智能安全], 2022.

Li Zhanzi [李战子] and Han Zeting [韩泽婷], “Weaponized Disinformation: Deepfake and Public Opinion Warfare” [“被武器化的虚假信息: 深度伪造与舆论 战”], *National Defense Technology* [国防科技], No. 3 2023.

Li, Zhouran, and Gavin Xu, “Despite High Ambition, China’s Media Influence Operation Is Far from Successful,” *The Diplomat*, May 28, 2022.

Liang Wei [梁卫], “Online Public Opinion Warfare: An Important Strategic Direction for Modern Warfare” [“网络舆论战: 现代战争的重要战略方向”], *Journal of Strategy and Decision-Making* [战略决策研究], September 2010.

Liang Xiaobo [梁晓波], “Cognitive Intelligence Language Weapon” [“认知智能语言武器”], *PLA Daily*, December 20, 2019. As of September 29, 2023: http://www.81.cn/jfjbmap/content/2019-12/20/content_250331.htm

Liang Xiaobo [梁晓波], “When Language Weapons Meet Artificial Intelligence” [“当语言武器邂逅人工智能”], *PLA Daily*, July 14, 2020.

Liang Xiaobo [梁晓波], “How Artificial Intelligence Affects Public Opinion Wars” [“人工智能如何影响舆论战”], *PLA Daily*, March 2, 2021a.

Liang Xiaobo [梁晓波], “On the Structure and Configuration of Defense Language Capability” [“论国防语言能力的构成与配置”], *Journal of Yunmeng* [云梦学刊], Vol. 42, No. 3, April 2021b.

Liang Xiaobo [梁晓波], “Cognitive Domain Operations Are the New Main Battlefield of Language Confrontation” [“认知域作战是语言对抗新的主战场”], China Social Sciences Network [中国社会科学网], May 17, 2022.

Liang Xiaobo [梁晓波], “Warfare Capability of Cognitive Domain: An Overseas Observation” [“认知作战能力域外观”], *Frontiers* [学术前沿], June 2023.

Liao Dongsheng [廖东升] and Li Ganqiang [李干强], “Current Status and Development Trends of Research on Psychological Warfare Effect Evaluation at Home and Abroad” [“国内外心理战效果评估研究现状及发展趋势”], *Hunan Social Sciences* [湖南社会科学], March 2007.

Liao Dongsheng [廖东升], “Characteristics and Methods of the U.S. Military’s Psychological Warfare Effectiveness Evaluation” [美军心理战效果评估方法与 特点], *National Defense Technology* [国防科技], April 2006.

Liao Dongsheng [廖东升], *Agent-Based Psychological Warfare Effectiveness Evaluation Methods* [基于 Agent 的心理战效果评估方法], Military Science Press [军事科学出版社], 2011.

Liao Dongsheng [廖东升], *Research on Evaluation Method and Application of Effects of Psychology Operation Based on Multi-Agent* [基于多智能体的心理战效果评估方法], Military Science Press [军事科 学出版社], 2016.

Liao Dongsheng [廖东升], Shen Yongping [沈永平], Chen Yinwu [陈英武], “Research on Effectiveness Evaluation of Psychological Operations Based on Multiple-Agent Modeling and Simulation Method” [“基于多 Agent 的心理战效果评估方法研究”], *Operations Research and Management Science* [运筹与管理], December 2007.

Lin Fuqiang [林福强], “Research on Key Technologies of Text Generation in Social Media” [“社交文本智能生成关键技术研究”], master’s thesis, National University of Defense Technology [国防科技大学], 2022.

Linjiang Guo and Qian Qin, “Wolf Warrior Spreads Superior: The Narrative and Effectiveness of Chinese Public Diplomacy Behaviours on Twitter,” *Journal of Chinese Political Science*, April 2024.

Link, Perry, “The Secret Politburo Meeting Behind China’s New Democracy Crackdown,” *China File*, February 20, 2011.

Liu Bin [刘玢], Cheng Gong [程功], and Mao Liwei [毛立伟], "Establishment of an Evaluation and Index System of Physchological Warfare Effectiveness" ["心理战效能评估及指标体系建构"], *National Defense Technology* [国防科技], Vol. 44, No. 6, December 2023.

Liu Huiyan [刘惠燕], Xiong Wu [熊武], Wu Xianliang [吴显亮], and Mei Shunliang [梅顺量], "Several Thoughts on Promoting the Construction of Cognitive Domain Operations Equipment for the Omni-Media Environment" ["全媒体环境下推进认知域作战装备发展的几点思考"], *National Defense Technology* [国防科技], October 2018.

Liu Jianqiang [刘建强], Lu Weidang [卢为党], and Huang Guoxing [黄国兴], "Research on Internet False Information Identification Based on Deep Learning" ["基于深度学习的互联网虚假信息识别研究"], *Technology Intelligence Engineering* [情报工程], Vol. 8, No. 5, 2022.

Liu Jifeng [刘戟锋], Lu Xiao [卢潇], and Liu Yangyue [刘杨钺], "Technological Support for Strategic Psychological Warfare" [战略心理战的技术支撑], *National Defense* [国防], February 2017.

Liu Qiang [刘强] and Ge Hanwen [葛汉文], "The Online Public Opinion Warfare Strategy of Western Military Powers and Its Revelations" ["西方大国军队网络舆论战略及启示"], *Journal of PLA Nanjing Institute of Politics* [南京政治学院学报], Vol. 32, No. 1, 2016.

Liu Xinran [刘欣然], Xu Yabin [徐雅斌], and Li Jixian [李继先], "Method for Automatically Generating Online Comments" ["网评贴文自动生成方法研究"], *Data Analysis and Knowledge Discovery* [数据分析与知识发现], Vol. 7, No. 4, July 2022.

Liu Yong [刘永], "Research on and Inspiration From the Application of Social Media in Public Opinion Warfare by Foreign Military" ["外军社交媒体在舆论战中的运用研究和启示"], *Military Correspondent* [军事记者], June 2022.

Long Yameng [龙亚蒙] and Zhou Yang [周洋], "Research on the Application of Social Bots in Public Opinion Struggle" ["社交机器人在舆论斗争中的应用研究"], *Military Correspondent* [军事记者], March 2022. As of September 29, 2023: http://www.81.cn/rmjz_203219/jsjz/2022nd3q_239302/yldzgzyj_239310/10165143.html

Lucas, Louise, and Emily Feng, "Inside China's Surveillance State," *Financial Times*, July 20, 2018.

Lu Wei [吕玮], Liu Bingjie [刘冰洁] "Psychological Offense Is Preferred Tactic: Recognitive Battles in Russia-Ukraine Conflict" ["攻心为上：俄乌冲突中的认知战交锋"], *Information Security and Communications Privacy* [信息安全与通信保密], November 2022.

Luo Yuan [罗援], "Build an Internet 'Volunteer Army' and Stick to the 'Shangganling' of Public Opinion: Some Thoughts on Launching Cyber Warfare and Fighting a Good Public Opinion War" ["打造网络 '志愿军,' 坚守舆论 '上甘岭': 开展网络战，打好舆论战的几点思考"], *China Information Security* [中国信息安全], April 2016.

Luo Yuzhen [罗语嫣], Li Wei [李璜], Wang Ruifa [王瑞发], Lei Wei [雷潇], Liao Dongsheng [廖东升], and Zhu Yingying [朱莹莹], "Characteristics and Key Technologies of the Common Domain for the Cognitive Domain" [认知域的公域特性及其关键技术], *National Defense Technology* [国防科技], April 2018.

Luong, Ngor, and Margarita Konaev, "In & Out of China: Financial Support for AI Development," Center for Security and Emerging Technology, August 10, 2023.

Lyngaas, Sean, and MJ Lee, "Exclusive: Xi Promised Biden China Wouldn't Interfere in 2024 Election," CNN, January 31, 2024.

Ma, Damien, and Neil Thomas, "In Xi We Trust: How Propaganda Might Be Working in the New Era," Marco Polo, September 12, 2018.

Ma Lap-hak, Pan Jiaqing, and Fok Leung-kiu, "Chinese State Media Hire Digital Firms to Boost Followers on Facebook, Twitter," Radio Free Asia, August 22, 2019, trans. by Luisetta Mudie.

Ma Linli [马林立], *Foreign Military Cyberspace Warfare: Current Situation and Development* [外军网电空间战: 现状与发展], National Defense Industry Press [国防工业出版社], 2012.

Ma Lu [马璐], "Research on the Guidance of Military Online Public Opinion in the New Era" ["新时代军队网络舆论引导研究"], master's thesis, National Defense University of Technology [国防科技大学], 2022.

Mak, Robyn, "Chinese AI Arrives by Stealth, Not with a Bang," Reuters, July 27, 2023.

Ma Ning [马宁], Liu Yijun [刘怡君], "Multiagent Modeling of Public Opinion Evolution Based on Hypernetwork" ["基于超网络的舆情演化多主体建模"], *Journal of Systems and Management* [系统管理学报], Vol. 24, No. 6, November 2015.

Marcellino, William, Nathan Beauchamp-Mustafaga, Amanda Kerrigan, Lev Navarre Chao, and Jackson Smith, *The Rise of Generative AI and the Coming Era of Social Media Manipulation 3.0: Next-Generation Chinese Astroturfing and Coping with Ubiquitous AI*, RAND Corporation, PE-A2679-1, September 2023. As of September 12, 2023: https://www.rand.org/pubs/perspectives/PEA2679-1.html

Martin, Perry, *China's Civilian Army: The Making of Wolf Warrior Diplomacy*, Oxford University Press, 2021.

Martinson, Ryan, "The Courage to Fight and Win: The PLA Cultivates Xuexing for the Wars of the Future," *China Brief*, June 1, 2016.

McCarthy, Simone, "Blinken Tells CNN the US Has Seen Evidence of China Attempting to Influence Upcoming US Elections," CNN, April 26, 2024.

McMillan, Robert, Dustin Volz, and Aruna Viswanatha, "China Is Stealing AI Secrets to Turbocharge Spying, U.S. Says," *Wall Street Journal*, December 25, 2023.

McReynolds, Joe, and Leigh Ann Luce, "China's Human Capital Ecosystem for Network Warfare," in Roy D. Kamphausen, ed., *The People of the PLA 2.0*, U.S. Army War College Press, 2021.

McReynolds, Joe, and John Costello, *China's Strategic Support Force: A Force for a New Era*, National Defense University, 2018.

McReynolds, Joe, and John Costello, "Planned Obsolescence: The Strategic Support Force In Memoriam (2015–2024)," *China Brief*, April 26, 2024.

Meng Haohan [孟浩瀚] and Lan Peixuan [兰培轩], "Strategies to Generate Capabilities in Public Opinion Warfare in the Cognitive Domain: Thoughts and Warnings Brought to Us by the Public Opinion Dissemination of American and Western Media" ["认 知域下舆论战的能力生成之策: 美西方媒体舆论传播带给我们的思考和警示"], *Military Correspondent* [军事 记者], January 2023.

Meta, *Quarterly Adversarial Threat Report*, May 2023.

"Methods for Selection of Subject Matter Direction Leaders and Direction Team Leaders of Mechanical and Power Engineering (Trial)" ["机械与动力 best365 网页版登录学科方向带头人及方向团队负责人选拔办法 (试行)"], Chongqing University of Science and Technology, June 2, 2022.

Meyer, David, "The Cost of Training AI Could Soon Become Too Much to Bear," *Fortune*, April 4, 2024.

MFA—*See* Ministry of Foreign Affairs of the People's Republic of China.

Miao Qinghai [缪青海], Wang Xingxia [王兴霞], Yang Jing [杨静], Zhao Yong [赵勇], Wang Yutong [王雨桐], Chen Yuanyuan [陈圆圆], Tian Yonglin [田永林], Yu Yi [俞怡], Lin Yilun [林懿伦], Yan Ran [鄢然], Ma Jiaqi [马嘉琪], Na Xiaoxiang [那晓翔], Wang Feiyue [王飞跃], "From Foundation Intelligence to General Intelligence: The State of the Art and Perspectives of GenAI and AGI Based on Foundation Models" ["从基础智能到通用智能: 基于大模型的 GenAI 和 AGI 之现状与展望"], *Acta Automatica Sinica* [自动化学报], Vol. 50, No 4, April 2024.

Microsoft Threat Intelligence, *Sophistication, Scope, and Scale: Digital Threats from East Asia Increase in Breadth and Effectiveness*, Microsoft, September 2023. As of September 12, 2024: https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RW1aFyW

Microsoft Threat Intelligence, *Same Targets, New Playbooks: East Asia Threat Actors Employ Unique Methods*, April 2024.

"Military-Civil Fusion Industry Technology Innovation Strategic Alliance Launched in Beijing" ["军民融合产业技术创新战略联盟在京启动"], Xinhua, July 10, 2017.

Miller, Alice L., "More Already on the Central Committee's Leading Small Groups," *China Leadership Monitor*, no. 44, July 28, 2014. As of September 29, 2023: https://www.hoover.org/sites/default/files/research/docs/clm44am.pdf

Ministry of Foreign Affairs of the People's Republic of China, "Position Paper of the People's Republic of China on Regulating Military Applications of Artificial Intelligence (AI)," December 14, 2021.

Ministry of Foreign Affairs of the People's Republic of China, "Fact Sheet on the National Endowment for Democracy," May 7, 2022.

Ministry of Foreign Affairs of the People's Republic of China, "US Hegemony and Its Perils," February 20, 2023a. As of September 29, 2023: https://www.mfa.gov.cn/eng/wjbxw/202302/t20230220_11027664.html

Ministry of Foreign Affairs of the People's Republic of China, "Qin Gang Refutes the Fallacy that China Tries to "Interfere" in the Canadian Election," March 3, 2023b.

Ministry of Foreign Affairs of the People's Republic of China, "Global AI Governance Initiative," October 20, 2023c.

Monaco, Nicholas J., "Computational Propaganda in Taiwan: Where Digital Democracy Meets Automated Autocracy," working paper, Computational Propaganda Research Project, June 2017.

Moriyasu, Ken, "China's Rulers See Social Media as a Theater of Battle," *Nikkei Asia*, September 15, 2016.

Mozur, Paul,a John Liu, and Cade Metz, "China's Rush to Dominate A.I. Comes With a Twist: It Depends on U.S. Technology," *New York Times*, February 21, 2024.

Mozur, Paul, Keith Bradsher, John Liu, and Aaron Krolik, "Leaked Files Show the Secret World of China's Hackers for Hire," *New York Times*, February 22, 2024.

Mozur, Paul, and Lin Qiqing, "How Facebook's Tiny China Sales Floor Helps Generate Big Ad Money," *New York Times*, February 7, 2019.

Mozur, Paul, Raymond Zhong, Aaron Krolik, Aliza Aufrichtig, and Nailah Morgan, "How Beijing Influences the Influencers," *New York Times*, December 13, 2021.

Mu Qingsheng [穆庆生], "A Brief Analysis of Modern Online Media Warfare with AI Technology" ["智能技术视域下的现代网络媒体战浅析"], *Military Correspondent* [军事记者], November 11, 2021. As of September 29, 2023: http://www.81.cn/rmjz_203219/jsjz/2021nd7q/yldzgzyj_203281/10106957.html

Nakashima, Ellen, "Pentagon Opens Sweeping Review of Clandestine Psychological Operations," *Washington Post*, September 19, 2022.

NIC—*See* National Intelligence Council.

National Intelligence Council, "Foreign Threats to the 2020 US Federal Elections," March 10, 2021.

National Intelligence Council, *Foreign Threats to the 2022 U.S. Elections*, December 23, 2022, redacted and released on December 11, 2023.

Ni, Adam, and Yun Jiang, trans., "Xi on External Propaganda and Discursive Power," China Neican, June 4, 2021.

Nilsson, Patricia, Sun Yu, and Michael Peel, "Behind the Scenes at China TV: Soft Power and State Propaganda," *Financial Times*, June 19, 2021.

Nimmo, Ben, C. Shawn Eib, L. Tamora, *Cross-Platform Spam Network Targeted Hong Kong Protests*, Graphika, September 2019.

Nimmo, Ben, Ira Hubert, and Yang Cheng, *Spamouflage Breakout: Chinese Spam Network Finally Starts to Gain Some Traction*, Graphika, February 2021.

"NLP Competition Practice: People's Daily Algorithm Competition Weibo Comment Generation" ["NLP 比赛实操: 人民网算法赛微博评论生成"], International Competition Alliance [国际竞赛联盟], February 25, 2023.

ODNI—*See* Office off the Director of National Intelligence.

O'Connor, Sarah, Fergus Hanson, Emilia Currey, and Tracy Beattie, "Cyber-Enabled Foreign Interference in Elections and Referendums," Australia Strategic Policy Institute, October 28, 2020.

O'Sullivan, Donie, Curt Devine and Allison Gordon, "China Is Using the World's Largest Known Online Disinformation Operation to Harass Americans, a CNN Review Finds," CNN, November 13, 2023.

Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China*, U.S. Department of Defense, 2023.

Office off the Director of National Intelligence, *Annual Threat Assessment of the U.S. Intelligence Community*, February 5, 2024.

Olesen, Alexa, "Where Did Chinese State Media Get All Those Facebook Followers?" *Foreign Policy*, July 7, 2015.

OpenAI, "Disrupting Deceptive Uses of AI by Covert Influence Operations," May 30, 2024.

"Open LLM Leaderboard," webpage, Hugging Face, undated. As of September 10, 2024: https://huggingface.co/spaces/open-llm-leaderboard/open_llm_leaderboard

Ou Ya [欧亚] and Xia Yue [夏玥], "Covert Persuasion: Computational Propaganda and Its Challenge to China's International Communication" ["隐蔽的说服: 计算式宣传及其对中国国际传播的挑战"], *International Communications* [对外传播], December 2019.

Pan, Jason, "China Subverting Elections: Premier," *Taipei Times*, November 2, 2018.

Pan Le [潘乐], Li Bicheng [李弼程], Wan Wang [万旺], and Zeng Rongshen [曾荣燊], "Dynamic Network Representation of Information Diffusion Based on Relationship Strength Theory and Feedback Mechanism" ["基于关系强度理论与反馈机制的信息传播动态网络表示"], *Computer Engineering* [计算机公工程], February 2023.

Paul, Christopher, William Marcellino, Michael Skerker, Jeremy Davis, and Bradley J. Strawser, *Planning Ethical Influence Operations: A Framework for Defense Information Professionals*, RAND Corporation, RR-A1969-1, 2023. As of August 19, 2024: https://www.rand.org/pubs/research_reports/RRA1969-1.html

Paun, Carmen, and Susannah Luthi, "What China's Vax Trolling Adds Up to," *Politico*, January 28, 2021.

People's Republic of China State Council, "New Generation AI Development Plan," July 20, 2017.

People's Daily Editorial Board [人民日报编委会], "A Scientific Guide to Consolidating and Strengthening Mainstream Ideology and Public Opinion" ["巩固壮大主流思想舆论的科学指南"], *People's Daily*, August 30, 2013.

Pettis, Michael, "What Is GDP in China?" Carnegie Endowment for International Peace, January 16, 2019.

PLA General Political Department [解放军总政治部], "Conscientiously Study and Implement the Spirit of General Secretary Xi's Important Speech at the National Propaganda and Ideological Work Conference" ["认真学习贯彻习总书记在全国宣传 思想工作会议上的重要讲话精神"], *PLA Daily*, August 22, 2013.

"PLA's Information Support Force Is Brand-New Strategic Arm: Defense Spokesperson," Xinhua, April 19, 2024.

People's Liberation Army National Defense University, *Silent Contest* [较量无声], film, 2013.

Pu Duanhua [濮端华], "An Analysis of China's Public Opinion Strategy in the Diaoyu Islands Dispute" ["钓鱼岛争端中的我舆论斗争策略探析"], *Military Correspondent* [军事记者], October 2012.

Qian Gang, "Parsing the 'Public Opinion Struggle,'" China Media Project, September 24, 2013.

Qiu Zeyu [邱泽宇], Qu Dan [屈丹], and Zhang Lianhai [张连海], "End-to-End Speech Synthesis Based on WaveNet" ["基于 WaveNet 的端到端语音合成方法"], *Journal of Computer Applications* [计算机应用], Vol. 39, No. 5, January 2019.

Quan Yong [全拥], "Research on Influence Analysis in Social Networks" ["面向社交网络的影响力分析关键技术研究"], doctoral dissertation, National University of Defense Technology [国防科学技术大学], October 2019.

Richburg, Keith B., "China's 'Weibo' Accounts Shuttered as Part of Internet Crackdown," *Washington Post*, January 3, 2013.

Rong Ting [荣婷] and Sun Jiaqian [孙佳倩], "Research on the '5D' Propaganda Strategy of Social Bots Based on the F-V Model Under Computational Propaganda: Taking Twitter Texts in War Situations as an Example" ["计算宣传下基于 F-V 模型的社交机器人 '5D' 宣传策略研究: 以战争情境中的推特文本为例"], *New Media and Society* [新媒体与社会], 2023.

Rudolph, Josh, "Translation: Recommendations for Handling Netizen Reaction to Li Wenliang's Death," *China Digital Times*, February 7, 2020.

Rupprecht, Andreas, "The PLA Air Force's 'Silver-Bullet' Bomber Force," *China Brief*, July 21, 2017.

Ryan, Fergus, Danielle Cave, and Vicky Xiuzhong Xu, *Mapping More of China's Tech Giants: AI And Surveillance*, Australian Strategic Policy Institute, November 2019.

Sabin, Sam, "China's National Security Laws Are Fueling TikTok Fears," Axios, March 15, 2024.

Saha, Swarnadeep, Peter Hase, and Mohit Bansal, "Can Language Models Teach Weaker Agents? Teacher Explanations Improve Students via Theory of Mind," paper, November 14, 2023.

Sanger, David, and Steven Lee Myers, "China Sows Disinformation About Hawaii Fires Using New Techniques," *New York Times*, September 11, 2023.

Schectman, Joel, and Christopher Bing, "Exclusive: Trump Launched CIA covert Influence Operation Against China," Reuters, March 14, 2024.

Schliebs, Marcel, Hannah Bailey, Jonathan Bright, and Philip N. Howard, *China's Public Diplomacy Operations: Understanding Engagement and Inauthentic Amplification of PRC Diplomats on Facebook and Twitter*, Programme on Democracy & Technology, Oxford Internet Institute, University of Oxford, May 2021.

Schneider, Jordan, "China's Hopeless Twitter Influence Operations," ChinaTalk, October 29, 2020.

Segal, Adam, "China's Twitter War," *Asia Unbound* blog, Council on Foreign Relations, March 22, 2012.

Serabian, Ryan, and Lee Foster, "Pro-PRC Influence Campaign Expands to Dozens of Social Media Platforms, Websites, and Forums in at Least Seven Languages, Attempted to Physically Mobilize Protesters in the U.S.," Mandiant, September 7, 2021.

Shambaugh, David, *China's Communist Party: Atrophy and Adaptation*, University of California Press, 2008.

Shambaugh, David, "China's Soft-Power Push: The Search for Respect," *Foreign Affairs*, Vol. 94, No.4, July/August 2015.

Shan, Shelley, "China Might Use AI to Sow Chaos: NSB," *Taipei Times*, April 27, 2023.

Shao Chengcheng [邵成成], Chen Xiangguo [陈祥国], Zhu Junxing [朱俊星], and Deng Kefeng [邓科峰], *Social Big Data Mining: Analysis of the Role of Social Bot Accounts* [社交大数据挖掘: 社交机器账户作用分析], National Defense University of Technology Press [国防科技大学出版社], 2022.

Shepard, Christian, and Eva Dou, "Xi Jinping's Quest for Total Control of China Is Just Getting Started," *Washington Post*, October 5, 2022.

Shi Xiaojin [史小今], "Analysis of New Paths for Localized International Communications Capacity Building" ["地方国际传播能力建设新路径探析"], *International Communications* [对外传播], 2022.

Shih, Gerry, "As Anger Explodes Over Doctor's Death, Beijing Firm Gives Chinese Government Advice," *Washington Post*, February 8, 2020a.

Shih, Gerry, "Chinese Firm Harvests Social Media Posts, Data of Prominent Americans and Military," *Washington Post*, September 14, 2020b.

Shih, Gerry, "Inside the Vast Digital Campaign by Hindu Nationalists to Inflame India," *Washington Post*, September 26, 2023c.

Shih, Gerry, Clara Ence Morse, and Pranshu Verma, "Covert Indian Operation Seeks to discredit Modi's Critics in the U.S.," *Washington Post*, December 10, 2023.

Shinn, Noah, Federico Cassano, Edward Berman, Ashwin Gopinath, Karthik Narasimhan, and Shunyu Yao, "Reflexion: Language Agents with Verbal Reinforcement Learning," paper, 2023.

Shrimpton, Thomas, "People's Liberation Army Exploring Military Applications of ChatGPT," U.S. Army Training and Doctrine Command, Foreign Military Studies Office, May 1, 2023.

Silver, Laura, Christine Huang, and Laura Clancy, "Negative Views of China Tied to Critical Views of Its Policies on Human Rights," Pew Research Center, June 29, 2022.

Silver, Laura, Christine Huang, and Laura Clancy, "China's Approach to Foreign Policy Gets Largely Negative Reviews in 24-Country Survey," Pew Research Center, July 27, 2023a.

Silver, Laura, Christine Huang, and Laura Clancy, "In East Asia, Many People See China's Power and Influence as a Major Threat," Pew Research Center, December 5, 2023b.

Smith, Jackson, and Nathan Beauchamp-Mustafaga, "PLA Social Media Warfare and the Cognitive Domain," *China Brief*, September 8, 2023.

Song, Chan Hee, Chan Hee Song, Jiaman Wu, Clayton Washington, Brian M. Sadler, Wei-Lun Chao, and Yu Su, "LLM-Planner: Few-Shot Grounded Planning for Embodied Agents with Large Language Models," paper, March 30, 2023.

Song, Yifan, Weimin Xiong, Dawei Zhu, Wenhao Wu, Han Qian, Mingbo Song, Hailiang Huang, Cheng Li, Ke Wang, Rong Yao, Ye Tian, and Sujian Li, "RestGPT: Connecting Large Language Models with Real-World Applications via RESTful APIs," paper, August 27, 2023.

Speeches on Xi Jinping's Media Thought (2018 Version) [习近平新闻思想讲义 (2018年版)], People's Press [人民出版社], 2018.

Stanford University, *Artificial Intelligence Index Report 2024*, April 2024.

Stokes, Mark, and Russell Hsiao, *The People's Liberation Army General Political Department: Political Warfare with Chinese Characteristics*, Project 2049 Institute, October 2013.

Stone, Alex, and Peter Wood, *China's Military-Civil Fusion Strategy*, China Aerospace Studies Institute, June 2020.

Su Ru [苏锐] "Fully Understand the Importance of Online Public Opinion Warfare" ["充分认识网络舆论战的重要性"], *Time Education* [时代教育], December 2015.

Sun Yixiang [孙亦祥] and Yu Yuanlai [余远来], "A Brief Discussion on "Intelligentized Public Opinion War" [刍议"智能化舆论战], *Military Correspondent*, January 2022. As of September 29, 2023: http://www.81.cn/rmjz_203219/jsjz/2022nd1q_227501/yldzgzyj_227505/10145217.html

Sun Yixiang [孙亦祥] and Liu Boda [刘博达], "'Four in One': Exploring the Way to Win in Public Opinion Struggles: Thoughts on Improving the Quality and Effectiveness of Public Opinion Struggles in the All-Media Era" ["'四位一体': 探究舆论斗争的制胜之道: 提高全媒体时代舆论斗争质效的思考"], *Military Correspondent* [军事记者], March 2023.

Surís, Dídac, Sachit Menon, and Carl Vondrick, "ViperGPT: Visual Inference via Python Execution for Reasoning," paper, March 14, 2023.

Talebirad, Yashar, and Amirhossein Nadiri, "Multi-Agent Collaboration: Harnessing the Power of Intelligent LLM Agents," paper, June 5, 2023.

Tang Jun [唐君], Zhang Lianhai [张连海], Li Jiaxin [李嘉欣], "A Real-time Robust Speech Synthesis Method Based on Improved Attention Mechanism" ["一种基于改进注意力机制的实时鲁棒语音合成方法"], *Journal of Signal Processing* [信号处理], Vol. 38, No. 3, August 2022.

Tang Tingting [唐婷婷], "Fragmented Dissemination of Information in the Social Media Era" ["社交媒体时代信息的碎片化传播"], *Press Outpost* [新闻前哨], No. 5, 2015.

Tang Tingting [唐婷婷], "The Imbalance and Reconstruction of the 'Reflection Arc' Structure in the Era of Information Fragmentation" ["信息碎片时代"反射弧"结构的失衡与再造"], *Journalism & Communication* [新闻传播], February 2015.

Tanner, Murray Scot, "Beijing's New National Intelligence Law: From Defense to Offense," Lawfare, July 20, 2017.

Tao Jianhua [陶建华], Fu Ruibo [傅睿博], Yi Jiangyan [易江燕], "Development and Challenge of Speech Forgery and Detection" ["语音伪造与鉴伪的发展与挑战"], *Journal of Cyber Security* [信息安全学报] Vol. 5, No. 2, March 2020.

Thomas, Elise, "Pro-CCP Spamouflage Campaign Experiments with New Tactics Targeting the US," Institute for Strategic Dialogue, April 1, 2024.

"There Is a Chinese Guide! 'One-Click' to Start the Experience! Llama 3 Is Online" ["有中文指南! '一键'开启体验！ Llama 3 上线"], SCNet [超算互联网], April 25, 2024.

Thorne, Devin, "AI-Powered Propaganda and the CCP's Plans for Next-Generation 'Thought Management,'" *China Brief*, Vol. 20, No. 9, May 15, 2020a.

Thorne, Devin, "Evaluating the Utility of Global Data Collection by Chinese Firms for Targeted Propaganda," *China Brief*, October 30, 2020b.

Thorne, Devin, *Inside China's National Defense Mobilization Reform: Capacity Surveys, Mobilization Resources, and "New-Type" Militias*, Recorded Future March 2022a.

Thorne, Devin, *1 Key for 1 Lock: The Chinese Communist Party's Strategy for Targeted Propaganda*, Recorded Future, September 28, 2022b.

To, James Jiann Hua, *Qiaowu: Extra-Territorial Policies for the Overseas Chinese*, Brill, 2014.

Tobin, Meaghan and Cade Metz, "China Is Closing the A.I. Gap with the United States," *New York Times*, July 25, 2024.

Toner, Helen, Jenny Xiao, and Jeffrey Ding, "The Illusion of China's AI Prowess: Regulating AI Will Not Set America Back in the Technology Race," *Foreign Affairs*, June 2, 2023.

Triolo, Paul, and Kendra Schaefer, "China's Generative AI Ecosystem in 2024: Rising Investment and Expectations," National Bureau of Asian Research, June 2024.

Tsai Yung-yao and Jonathan Chin, "China Is Posting Fake Videos of President: Sources," *Taipei Times*, January 11, 2024.

Turnbull, Malcolm, "Speech Introducing the National Security Legislation Amendment (Espionage and Foreign Interference) Bill 2017," December 7, 2017.

U.S. Department of Justice, "40 Officers of China's National Police Charged in Transnational Repression Schemes Targeting U.S. Residents," press release, April 17, 2023.

U.S.-China Economic and Security Review Commission, "China's Global Influence and Interference Activities," hearing, March 23, 2023. As of September 25, 2023: https://www.uscc.gov/hearings/chinas-global-influence-and-interference-activities

Varrall, Merriden, "Behind the News: Inside China Global Television Network," webpage, Lowy Institute, January 10, 2020.

Wahlstrom, Alden, Jess Xia, Alice Revelli, and Ryan Serabian, "Information Operations Targeting 2022 U.S. Midterm Elections Include Trolling, Narratives Surrounding Specific Races, Politicians," Mandiant, December 19, 2022.

Wang Chunshi [王春诗], *Research on the Cognitive Model of Online Public Opinion of Emergencies Based on Brain Psychological Mechanism* [基于脑心理机制的突发事件网络舆情认知模式研究], Fudan University, 2011.

Wang Danna [王丹娜], "Mode, Response and Outlook of Online Public Opinion Warfare in the US Election" ["美国大选网络舆论战模式, 应对与展望"], *China Information Security* [中国信息安全], September 2019.

Wang Furong [王芙蓉], Ou Lishou [欧立寿], and Liao Dayan [廖达炎], “Preliminary Study on the Psychological Warfare Effectiveness Evaluation Index System” [“心理战效能评估指标体系初探”], *National Defense Technology* [国防科技] May 2007.

Wang Haitao [王海涛] and Han Donghui [韩冬晖], “Exploration of the Application of Blockchain Technology in the Era of Integrated Media” [“区块链技术在融媒体时代的应用探索”], *Radio and Television Information* [广播电视信息], June 2020.

Wang, Haiyang, Zhiliang Tian, Xin Song, Yue Zhang, Yuchen Pan, Hongkui Tu, Minlie Huang, and Bin Zhou, “Intent-Aware and Hate-Mitigating Counterspeech Generation via Dual-Discriminator Guided LLMs,” *Proceedings of the 2024 Joint International Conference on Computational Linguistics, Language Resources and Evaluation*, 2024.

Wang Hejing [王鹤静] and Wu Dan [吴丹], “Strategic Tactics of the U.S. Cyber Army” [“美 国网军的战略战法”], *Military Digest*, July 2023.

Wang, Hongru, Rui Wang, Fei Mi, ZezhongWang, RuifengXu, and Kam-FaiWong, “Chain-of-Thought Prompting for Responding to In-Depth Dialogue Questions with LLM,” paper, May 19, 2023.

Wang Huazhen [王华珍], Hu Xuanlang [胡渲郎], Lin Zhizhong [林致中], You Haibin [尤海滨], He Ting [何霆], and Li Bicheng [李弼程], “Automatic Generation Method, Device, Equipment and Medium for Large Model Fine Tuning Instruction” [“一种大模型微调指令自动化生成方法, 装置, 设备及介质”], Chinese patent number CN117573835A, February 20, 2024.

Wang Jinxia [王金霞], “Emotional Computing: Achieving Intelligent Interaction Technology” [“情感计算: 成就智能交互技术”], *PLA Daily*, April 8, 2022.

Wang Lianshui [王连水] and Ni Heliang [倪合良], “Military Soft Power in the Field of Vision to Win lnformationalized Wars” [“打赢信息化战争视阈中的军事软实力”], *China Military Science* [中国军事科学], March–April 2008.

Wang Lin [王林] and Wang Yitao [王逸涛], “A Study of the Strategy of Cultural Effect in Media [Public Opinion] Struggles” [“舆论较横中文化致效的策略探析”], *China Military Science* [中国军事科学], November–December 2005.

Wang Mingliang [王明亮], “An Analysis of the Features of Information Warfare” [“信息化战争特征简析”], *China Military Science* [中国军事科学], January–February 2005.

Wang Ruxi [王汝茜], Cao Yu [曹宇], “An Analysis of Public Opinion Counterattack Strategies During Wartime” [“战时舆论反击策略探析”], *Research on Grassroots Political Work* [基层政治工作研究], No. 1, 2012.

Wang Shizhuo [王世卓], “War Gaze: Analysis of the U.S. Military’s Online Public Opinion Struggle Strategies” [“战争目光: 美军网络舆论斗争策略分析”], *Military Digest* [军事文摘], November 2019.

Wang Wei [王炜], Xu Xiaowen [徐晓文], Li Bicheng [李弼程], and Zhang Zhengdao [章正道], “International Event Risk Deduction Method and Terminal” [“一种国际事件风险推演方法及终端”], Chinese patent number CN111310116A, filed December 30, 2019.

Wang Yashen [王亚珅], Li Qiang [李强], and Shi Ge [石戈], “Analysis of Impact of ChatGPT on Development of Social Bots Technology” [“ChatGPT 对社交机器人技术发展的影响分析”], *Unmanned Systems Technology* [无人系统技术], 2023.

Wang Yue [王跃], Yao Fang [姚芳], and Wang Pei [王培], “A Brief Discussion on the Offensive of Online Public Opinion Warfare in System-Based Operations” [“基于体系作战中网络舆论战进攻刍论”], *Electronic Test* [电子测试], November 2013.

Wang Yunlong [王云龙] and Zhang Zhiwei [张智伟], “Emerging Communication Technology Revolution and Developmental Trends in Military Struggle for Public Opinion” [新兴传播技术革命与军事舆论斗争发展趋势], *China Military Science* [中国军事科学], August 2020.

Warren, Patrick, Darren Linvill, Leland Fecher, Jayson Warren, Steven Sheffield, Jack Taylor, Alexa Gubanich, Parker Hundley, Josiah Lamont, Sarah Meadows, Josephine Rohrer, Molly Sutton, and Shay Easler, *The 5-year Spam: Tracking a Persistent Chinese Influence Operation*, Clemson University Watt Family Innovation Center Media Forensics Hub, 2023.

Watts, Jonathan, “China Backs Down Over Controversial Censorship Software,” *The Guardian*, June 16, 2009.

Webster, Graham, Rogier Creemers, Elsa Kania, and Paul Triolo, “Full Translation: China’s ‘New Generation Artificial Intelligence Development Plan,’” DigiChina, August 1, 2017.

Webster, Graham, and Ryan Haas, “A Roadmap for a US-China AI Dialogue,” Brookings Institution, January 10, 2024.

Wei, Jason, Xuezhi Wang, Dale Schuurmans, Maarten Bosma, Brian Ichter, Fei Xia, Ed Chi, Quoc Le, and Denny Zhou, “Chain-of-Thought Prompting Elicits Reasoning in Large Language Models,” paper, January 10, 2023.

"We Must Be as Ruthless as We Were in Shangganling on the Field of Ideological Struggle" ["要像坚守上甘岭那样铆在意识形态斗争的阵地上"], *PLA Daily*, September 18, 2013.

"With the Approval of the Chairman of the Central Military Commission Xi Jinping, the Central Military Commission Issued the 'Chinese People's Liberation Army Joint Operations Outline (Trial)'" ["经中央军委主席习近平批准 中央军委印发'中国人民解放军联合作战纲要(试行)'"], Xinhua, November 13, 2020.

"Womin Hi-Tech Became One of the Stops of the 'National Data Governance' Investigation" ["沃民高科成为'国家数据治理'考察的其中一站"], *Southern China Public Opinion* [中南舆情], August 21, 2020.

Wu Jie [伍杰] and Liao Dongsheng [廖东升], "Analysis of Online Public Opinion Effectiveness Evaluation" ["网络舆论战效能评估探析"], *National Defense Technology* [国防科技], Vol. 35, No. 2, April 2014.

Wu Jieming [吴杰明] and Yang Hongzhang [杨红章], "Basic Practices of U.S. Military Image Communication and Its Implications for Our Military" ["美军形象传播的基本做法及对我军的启示"], *Theoretical Studies on PLA Political Work* [军队政工理论研究], February 2007.

Wu Jieming [吴杰明] and Liu Zhifu [刘志富], *An Introduction to Public Opinion Warfare, Psychological Warfare, and Legal Warfare* [舆论战心理战法律战概论], National Defense University Press, 2014.

Wu Yingxing [吴应星] and Wang Lancheng [王兰成], "Thoughts on Accelerating the Construction of Military-Related Online Public Opinion Struggle Capabilities" ["加快推进互联网涉军舆论斗争能力手段建设的思考"], *Political Work Journal* [政工学刊], 2020.

Wu Qiong [吴穹] and Ma Yongfu [马永富], "Focusing on the Needs of Joint Operations and Strengthening the Training of 'Media Traders' in Our Military Officers and Soldiers" ["着眼联合作战需求加强我军官兵'媒商'培养"], *Theoretical Studies on PLA Political Work* [军队政工理论研究], Vol. 15, No. 2, April 2014.

Wu Xiaojian [武啸剑], "How Social Bots Manipulate Public Opinion in the Age of Intelligent Communication: An Analysis of Narrative and Cognition Under Crisis" ["危机下的叙事与认知: 智能传播时代社交机器人舆论干预研究"], *Journalism and Mass Communication* [新闻界], September 2023.

Wu Yinsheng [吴银胜] and Mei Jianbing [梅建兵], "Some Inspirations Drawn from the Application of the Booming Social Media in Psychological Warfare ["社交媒体的迅猛发展及心理战运用的几点启示"]," *National Defense Technology* [国防科技], May 2011.

"Xi Jinping Talks About Vigorously Strengthening News and Public Opinion Work" ["习近平谈大力加强新闻舆论工作"], Party Building Online [党建网], December 10, 2021. As of September 28, 2023: http://www.dangjian.com/shouye/toutiao/202112/t20211210_6263234.shtml

"Xi Jinping Stressed During the 30th Collective Study of the Political Bureau of the Communist Party of China Central Committee the Need to Strengthen and Improve International Communication Work to Showcase a Real, Three-Dimensional and Comprehensive China" ["习近平在中共中央政治局第三十次集体学习时强调 加强和改进国际传播工作 展示真实立体全面的中国"], Xinhua [新华], June 1, 2021. As of June 1, 2023: http://www.xinhuanet.com/politics/2021-06/01/c_1127517461.htm.

"Xi Jinping Accepts an Interview with Russian Media" ["习近平接受俄罗斯媒体采访"], Xinhua, July 3, 2017.

"Xi Jinping Delivered a Report to the 20th CPC National Congress on Behalf of the 19th CPC Central Committee" ["习近平代表第十九届中央委员会向党的二十大作报告"], Xinhua, October 16, 2022.

"Xi Jinping Emphasized at the National Propaganda and Ideological Work Conference that We Should Keep the Overall Situation in Mind, Grasp the General Trend, Focus on Major Issues, and Strive to Do a Better Job in Propaganda and Ideological Work; Liu Yunshan Attended the Meeting and Delivered a Speech" ["习近平在全国宣传思想工作会议上强调胸怀大局把握大势着眼大事 努力把宣传思想工作做得更好, 刘云山出席会议并讲话"], Xinhua, August 20, 2013.

"Xi Jinping: Accelerate the Development of Media Integration and Build an All-Media Communication Pattern" ["习近平: 加快推动媒体融合发展 构建全媒体传播格局"], *Seeking Truth*, March 15, 2019.

"Xi Jinping: Move Forward the Construction of a Cyber Superpower Through Indigenous Innovation" ["习近平: 自主创新推进网络强国建设"], Xinhua, April 21, 2018.

Xi Jinping, “The Full Text of Xi Jinping’s Speech on August 19 Was Circulated Online: ‘Dare to Catch, Dare to Regulate, and Dare to Show the Sword’” [“网传习近平 8•19 讲话全文：言论方面要敢抓敢管敢于亮剑”], China Digital Times, November 4, 2013. Xia Rongjing [夏榕璟], “Research on English-Chinese Neural Machine Translation of Social Networks for Military-Political Domain” [“面向军政领域的社交网络英汉神经机器翻译研究”], master’s thesis for PLASSF Information Engineering University [战略支援部队信息工程大学], 2022.

Xiang Debao [相德宝], Chen Qian [陈茜], and Xu Xiongxiong [徐雄雄], “The Public Opinion Intervention of Social Bots on China-related Human Rights Issues and China’s Coping Strategies” [“社交机器人对涉华人权议题的舆论干预及中国应对策略”], *Journal of United Front Science* [统一战线学研究], 2023.

Xiang Haoyu [项昊宇], “Japan’s Pursuit of Military ‘Relaxation’ Is Very Subtle” [“谋求军事‘松绑,’日本这招很隐蔽”], *Global Times* [环球时报], November 7, 2022.

Xiao, Muyi, Drew Jordan, Meg Felling, and Christoph Koettl, “How China Is Reshaping the Coronavirus Narrative,” *New York Times*, March 18, 2020.

Xiao Tianliang [肖天亮], ed., *Science of Military Strategy* [战略学], National Defense University Publishing House [北京国防大学出版社], 2015.

Xiao Tianliang [肖天亮], ed., *Science of Military Strategy* [战略学], National Defense University Publishing House [北京国防大学出版社], 2017.

Xiao Tianliang [肖天亮], ed., *Science of Military Strategy* [战略学], National Defense University Press [国防大学出版社], 2020.

Xiao Xunlong [肖勋龙] and Li Shouqi [李寿其], “Theoretical Analysis of Online Public Opinion Warfare” [“网络舆论战的理论探析”], *National Defense Technology* [国防科技] Vol. 35, No. 2, April 2014.

Xiang Haoyu [项昊宇], “Japan’s Pursuit of Military ‘Relaxation’ Is Very Subtle” [“谋求军事‘松绑,’日本这招很隐蔽”], *Global Times* [环球时报], November 7, 2022, https://www.ciis.org.cn/yjcg/sspl/202211/t20221109_8789.html

Xia Xiao [夏晓], “Computational Propaganda: A New Weapon in Cognitive Domain Operations” [“计算宣传：认知域作战的新武器”], *China Military Network* [中国军网], February, 28, 2023. As of September 29, 2023: http://www.81.cn/jfjbmap/content/2023-02/28/content_334621.htm

Xia Ziran [夏子然], “Analysis and Simulation of Group Behavior in the Evolution of Online Public Opinion Based on BDI Model” [“基于 BDI 模型的网络舆情演变过程中群体行为分析与仿真”], Nanjing: Nanjing University of Science & Technology [南京理工大学], 2015.

Xiong Yao [熊尧], Li Bicheng [李弼程], and Wang Ziyue [王子玥], “Analysis of Public Opinions in Network Communication Based on the Two-Level Communication Theory” [“基于两级传播理论的舆论超网络传播分析”], *CAAI Transactions on Intelligent Systems* [智能系统学报], Vol. 15, No. 5, October 2019.

Xiong Yao [熊尧], Li Bicheng [李弼程], and Wang Ziyue [王子玥], “Fuzzy-Synthetical Evaluation of Online Public Opinion Guidance” [“基于模糊综合评判的网络舆论引导效果评估”], *Journal of Modern Information* [现代情报], Vol. 40, No. 6, June 2020.

Xu Yingxue [徐英雪] and Lan Fen [兰芬], “WeChat: a New Weapon of Online Public Opinion Warfare” [“微信:网络舆论战的新利器], *National Defense Technology* [国防科技], Vol. 35, No. 2, April 2014.

Yang, Eddie, “The Limits of AI for Authoritarian Control,” working paper, August 2023.

Yang, Eddie, and Margaret E. Roberts, “The Authoritarian Data Problem,” *Journal of Democracy*, Vol. 34, No 4, October 2023.

Yang Guoping [杨国平], Luo Anmao [罗安茂], and Yin Yanxin [尹延欣], “The Psychological Warfare Reserve Forces Should Be Studying” [预 备役部队要研究的心理战], *Southwest Militia* [西南民兵], February 2007.

Yang Sen [杨森], “Research on Cross-Modal Natural Language Generation” [“跨模态自然语言生成关键技术研究”], master’s thesis, National University of Defense Technology [国防科技大学], 2021.

Yang Shuai [杨帅], Qiao Kai [乔凯], and Chen Jian [陈健], “Overview on Speech Synthesis, Forgery and Detection Technology” [“语音合成及伪造, 鉴伪技术综述”], *Computer Systems and Applications* [计算机系统应用], Vol. 31, No. 7, July 2022.

Yang Tengfei [杨腾飞], Zhu Yaohua [朱曜华], and Zhang Weichao [张伟超], “The Characteristics and Offensive-defensive Countermeasures of the Network Consensus Warfare in Peacetime” [“和平时期网络舆论战的特点及对策刍议”], *National Defense Technology* [国防科技], Vol. 35, No. 2, April 2014.

Yang Yang [杨洋] and Hu Zhongjian [胡中健] “U.S. Military Network Covert Propaganda in the Era of Artificial Intelligence: Operational Changes and Inspiration” [人工智能时代美军网络隐蔽宣传: 行动变革及启示] *Journal of Intelligence* [情报杂志] No. 9, 2023.

Yang Yucai, “CSIS’ War Games, Designed for Cognitive Warfare Against China, Will Have Little Influence,” *Global Times*, August 24, 2022.

Yang Yunxue [杨运学] and Wei Yukuan [魏玉宽], “Take a New Path of Military-Civil Fusion for Psychological Warfare” [“走开心理战军民融合式发展的新路子”], *Journal of Xi’an Politics Institute of PLA* [西安政治学院学报], Vol. 27, No. 3, June 2014.

Yao Fu, Litu Ou, Mingyu Chen, YuhaoWan, Hao Peng, and Tushar Khot, “Chain-of-Thought Hub: A Continuous Effort to Measure Large Language Models’ Reasoning Performance,” paper, 2023.

Yao, Shunyu, Dian Yu, Jeffrey Zhao, Izhak Shafran, Thomas L. Griffiths, Yuan Cao, and Karthik Narasimhan, “Tree of Thoughts: Deliberate Problem Solving with Large Language Models,” paper, 2023.

Ye, Josh, “China Approves over 40 AI Models for Public Use in Past Six Months,” Reuters, January 28, 2024.

Ye Shulan [叶淑兰], “Building China’s International Voice: Achievements, Challenges and Deepening Paths” [“中国国际话语权建设：成就, 挑战与深化路径”], China Institute of International Studies [中国国际问题研究院], 2021. As of September 29, 2023: https://www.ciis.org.cn/gjwtyj/dqqk/202107/P020210719448560560547.pdf

Yin Hujun, “Data Representation by Deep Learning,” online presentation, 2018.

York, Jillian, “Syria’s Twitter Spambots,” *The Guardian*, April 21, 2011.

Yu Guang, Deputy Director of the Political Work Department of the Military Commission: Work Together to Create a Clearer Online Public Opinion Space” [“军委政治工作部副主任禹光：携手打造更加清朗的网络舆论空间”], China Military Online, November 24, 2017.

Yu Ning, “US’ ‘Cognitive Warfare’ Over Taiwan Futile in Face of Facts, China’s Strength,” *Global Times*, July 7, 2022.

Yu Xintian [俞新天], “The Threat of Cognitive Warfare Against China and the Upgrade of China’s People-to-People Diplomacy” [“西方对华认知战的威胁与中国民间外交的提升”], *International Studies* [国际问题研究], No. 6, 2022.

Yu Youqin [郁友琴], “Research on Microblog User Interest Recognition and Text Information Recommendation Technology” [“微博用户兴趣识别与文本信息推荐技术研究”], master’s thesis, Huaqiao University [华侨大学], 2021.

Yu Youqin [郁友琴] and Li Bicheng [李弼程], “Microblog User Interest Recognition Based on Multigranularity Text Feature Representation” [“基于多粒度文本特征表示的微博用户兴趣识别”], *Computer Science* [计算机科学], December 2021.

Yu Yuanlai [余远来] and Chen Qian [陈茜], “Effective Mechanism and Strategy Choice of Cognitive Domain Operations” [“认知域作战的致效机理与策略选择”], *Front of Thought and Theory* [思想理论战线], July 2022.

Yu Yuanlai [余远来] and Mo Yifei [莫一斐], “Take the Initiative: Seize the Commanding Heights of the International Public Opinion Struggle: Thoughts on Fighting the International Public Opinion War Against the US Hyping Up Issues Involving Our Military” [“主动作为：抢占国际舆论斗争制高点: 打好反制美炒作涉我军议题的国际舆论战的思考”], *Military Correspondent* [军事记者], May 2023.

Yu Yuanlai [余远来] and Sun Yixiang [孙亦祥], “Research on Global Social Communication and Cyberspace Ideological Governance” [“全球社交化传播与网络空间意识形态治理研究”], *International Communications* [对外传播], No. 11, 2021.

Zeng Huafeng [曾华锋] and Shi Haiming [石海明], *Command of the Mind: The Rules of War and National Security Strategy in the Global Media Age* [制脑权: 全球媒体时代的战争法则与国家安全战略], Academy of Military Science Press, 2014

Zeng Lian [曾率], Wu Gang [吴刚], and Jiang Bo [姜波], “A Preliminary Study on the Application of Public Opinion Warfare to Safeguard [Our] Country’s Space Interests” [“维护我国太空利益舆论战运用初探”], *Journal of Xi’an Politics Institute* [西安政治学院学报], Vol. 27, No. 3, June 2014.

Zeng Rongshen [曾荣燊], Li Bicheng [李弼程], Chen Gang [陈刚], and Xiong Yao [熊尧], “Analysis of Public Opinion Evolution Based on Online-Offline Supernetwork Model” [“基于线上-线下超网络模型的舆论演化仿真分析”], *Application Research of Computers* [计算机应用研究], October 2023.

Zeng Tao [曾涛], “On How to Strengthen the Governance of Negative Public Opinion Related to the Military Under the Conditions of Informatization and Intelligence” [“浅谈如何加强信息化智能化条件下涉军负面舆情治理”], *Defence Industry Conversion in China* [中国军转民], September 2023.

Zeng Wenlong [曾文龙], Liu Dan [刘丹], Zhang Chao [张超], “Intelligent Copy-Cleaning Based on large Models: Event Key Point Extraction and Report Generation” [“基于大模型的智能抄清: 事件要点抽取与报告生成”], *Microcomputer and Its Applications* [微型机与应用], December 2023.

Zeng Xiangmin [曾祥敏], Tang Xuan [汤璇], and Bai Xiaoqing [白晓晴], “Strengthen the Construction of China’s Foreign Discourse System from a Strategic Perspective” [“从战略高度加强中国对外话语体系建设], *Guangming Daily*, November 11, 2019. As of September 27, 2023:
http://theory.people.com.cn/n1/2021/1119/c40531-32286341.html

Zhang, Albert, Tilla Hoja, and Jasmine Latimore, *Gaming Public Opinion: The CCP’s Increasingly Sophisticated Cyber-Enabled Influence Operations*, Australian Strategic Policy Institute, 2023.

Zhang Huaping [张华平], Li Chunjin [李春锦], Wei Shunping [魏顺平], Geng Guotong [耿国桐], Li Weiwei [李伟伟], and Li Yugang [李玉岗], “Large Language Model-Driven Open-Source Intelligence Cognition” [“大语言模型驱动的开源情报认知认领”], *National Defense Technology* [国防科技], March 2024.

Zhang, Hongxin, Du, Weihua, Shan, Jiaming, Zhou, Qinhong, Du, Yilun, Tenenbaum, Joshua B., Shu, Tianmin, & Gan, Chuang. “Building Cooperative Embodied Agents Modularly with Large Language Models,” paper, February 17, 2024.

Zhang Hongzhong [张洪忠], Zhao Bei [赵蓓], and Shi Weiying [石韦颖], “Behavioral Analysis of Social Bots Participating in the Sino-US Trade Negotiation Issues on Twitter” [“社交机器人在 Twitter 参与中美贸易谈判议题的行为分析”], *Journalism and Mass Communication Monthly* [新闻界], 2020.

Zhang Jingxuan [张晶轩] and Liao Dongsheng [廖东升], “The Psychological Significance of Online Public Opinion Warfare” [“网络舆论战的心理学意义”], *National Defense Technology* [国防科技], Vol. 35, No. 2, April 2014.

Zhang, Sarah, Jeanny Yu, and Zheping Huang, “Baidu Sinks Most Since 2022 Despite Denying Links to PLA AI,” Bloomberg, January 14, 2024.

Zhang Wei [张伟], Tang Xiaoyan [汤晓燕], and Chen Xi [陈曦], “A Brief Analysis of the Development Trend of Public Opinion Warfare in Modern Wars” [“简析现代战争中舆论战的发展走向”], *Military Correspondent*, August 2019. As of September 18, 2023:
http://www.81.cn/rmjz_203219/jsjz/2019nd8q/tsysk_203535/9615656.html

Zhang Weikang [张伟康], "Research on Multi-Turn Dialogue Generation Method Based on Improved Context Modeling" ["基于改进上下文建模的多轮对话生成方法研究"], master's thesis, National University of Defense Technology [国防科技大学], 2022.

Zhang Xiaofeng [张小峰], Xie Jun [谢钧], Luo Jianxin [罗健欣], "Overview of Deep Learning Speech Synthesis Technology " ["深度学习语音合成技术综述"], *Computer Engineering and Applications* [计算机工程与应用], Vol. 57, No. 9, March 2021.

Zhang Xiaofeng [张小峰], Xie Jun [谢钧], and Luo Jianxin [罗健欣], "Research on Deep Learning Speech Synthesis Technology" ["深度学习语音合成技术研究"], *Computer Era* [计算机时代], September 2020.

Zhang Xiaoping [张小平] and Zheng Xuan [郑玄], "Academic Frontier and Research Prospects of Military Communication Studies" ["军事传播学学术前沿与研究展望"], *Military Culture Studies* [军事文化研究], June 2023.

Zhang You [张优], "Research and Application of End-to-end Chinese Text Generation" ["端到端的汉语文本生成研究与应用"], master's thesis, Qinghai Normal University, 2022.

Zhang Yunbi, "US 'Cognitive Warfare' Tricks Stir Up Tension," *China Daily*, March 7, 2023.

Zhang Zhiwei [张智伟], "Towards Intelligentized Online Public Opinion Warfare" ["走向智能化的网络舆论战"], *Political Workers* [政工导刊], February 2020.

Zhang Xingxin [张兴信], Guo Zhigang [郭志刚], and Chen Gang [陈刚], "Review on Controlled Text Generation Technology" ["受控文本生成技术研究综述"], *Journal of Information Engineering Universit*y [信息工程大学学报], 2022.

Zhang Zhiwei [张智伟], "Cognitive Domain Operations from an Intelligentized Perspective" ["智能化视阈下的认知域作战"], *PLA Daily*, December 8, 2022.

Zhao Qiang [赵强], "Insight Behind the Scenes of Western Communication Power" ["透视西方传播权力转移的背后"], *People's Daily*, April 16, 2018.

Zhao Huiqin [赵慧琴], Zhou Hui [周翬], Tang Huaili [汤怀礼], Li Bicheng [李弼程], Peng Tianqiang [彭天强], Cao Wen [曹闻], and Zhang Chenmin [张晨民], "System for Blocking Off Erotic Images and Unhealthy Information in Internet" ["在互联网上堵截色情图像与不良信息的系统"], Chinese patent number CN1761204A, filed November 18, 2005.

Zhao Lijian, "Foreign Ministry Spokesperson Zhao Lijian's Regular Press Conference," Ministry of Foreign Affairs of the People's Republic of China, August 29, 2022.

Zhao Xihua [赵熙华], "Online Influence Power Is Combat Power" ["网络影响力就是战斗力"], *PLA Daily*, August 12, 2016.

Zhao Yanqiu [赵艳秋] "Evaluation of the Effectiveness of Dismantling Enemy Forces During the Agrarian Revolution" ["土地革命时期瓦解敌军工作效果评估"], *Literature on Party Building* [党史文苑], April 2015.

Zhao Yu [赵宇], "An Exploration Into the Application of Journalism and Communication Principles in Online Public Opinion Warfare" [新闻传播学原理在网络舆论战中的运用探微"], *Journal of News Research* [新闻研究导刊], February 2020.

Zheng Zhongliu [郑重刘] and Ying Yuanli [颖袁莉], "Supporting Theoretical Innovation in Cognitive Warfare with Cognitive Operations Experimentation" ["用认知域作战实验支撑认知域作战理论创新"], *China Military Science* [中国军事科学], November 2022.

Zhong, Raymond, Aaron Krolik, Paul Mozur, Ronen Bergman, and Edward Wong, "Behind China's Twitter Campaign, a Murky Supporting Chorus," *New York Times*, June 8, 2020.

Zhong, Raymond, and Paul Mozur, "For the U.S. and China, a Technology Cold War That's Freezing Over," *New York Times*, March 23, 2018.

Zhong Xingrui [仲星睿], "A Study of U.S. Military Public Diplomacy Since the New Century ["新世纪以来美国军事公共外交研"], master's thesis, National University of Defense Technology [国防科学技术大学], December 2020.

Zhou Fangyin [周方银], "Research Developing a Precise Communications Strategy for Southeast Asia Under in the New Era" ["新形势下对东南亚精准传播策略研究"], *International Communications* [对外传播], 2022.

Zhou Jie [周杰], Lin Chen [林琛], Li Bicheng [李弼程], "Research of Sentiment Classification for Netnews Comments by Machine Learning" ["基于机器学习的网络新闻评论情感分类研究"], *Journal of Computer Applications* [计算机应用], Vol. 30, No. 4, April 2010.

Zhou Yang [周洋], "Research on Optimization of Propaganda Effectiveness in Online Public Opinion Warfare" ["网络舆论战宣传致效的优化研究"], *Military Correspondent* [军事记者], December 2009.

Zhou Yang [周洋], "Grasping the Trend: Improving the Ability of Our Army to Accurately Disseminate Military Information, Research on the Accurate Dissemination of Military Information in the Era of Smart Media" ["把握趋势: 提升我军军事信息精准传播能力, 智媒时代军事信息的精准传播研究"], *Military Correspondent* [军事记者], February 2023.

Zhou Zhongyuan [周中元], Liu Xiaoyi [刘小毅], and Li Qingwei [李清伟], "ChatGPT Technology and Its Impact on Military Security" ["ChatGPT 技术及其对军事安全影响"], *Command Information System and Technology* [指挥 信息系统与技术], April 2023.

Zhouran Li and Gavin Xu, "Despite High Ambition, China's Media Influence Operation Is Far from Successful," *The Diplomat*, May 28, 2022.

Zhu, Julie, Kevin Huang, Yelin Mo, and Roxanne Liu, "Exclusive: China to Launch $40 Billion State Fund to Boost Chip Industry," Reuters, September 5, 2023.

Zhu Zhi [朱志], "A Study on Effect Evaluation of Public Opinion Warfare Model Based on Transmission Dynamics Theory" ["运用传播动力学理论建立舆论战效果评估模型"], *National Defense Technology* [国防科技], January 2010.

Zhu Zhi [朱志], Liu Fengjian [刘凤健], and Liao Dongsheng [廖东升], "Research on Psychological Warfare Effect Evaluation Model Based on Communication Dynamics" ["基于传播动力学的心理战效果评估模型研究"], *Theoretical Studies on PLA Political Work* [军队政工理论研究], February 2012.

Zhuang Rongwen [庄荣文], "Scientifically Understanding the Natural Laws of Online Communication, Striving to Boost the Level of Internet Use and Network Governance" ["科学认识网络传播规律 努力提高用网治网水平"], *Seeking Truth*, September 16, 2018.

Zhuoran Li, "The CCP's Changing Understanding of the Soviet Union's Collapse," *The Diplomat*, October 8, 2022.

Zi Yang, "How China Leverages Artificial Intelligence for Military Decision-Making," in Roy D. Kamphausen, ed., *China's Military Decision-Making in Times of Crisis and Conflict*, National Bureau of Asian Research, 2023.

Zuo Hongbo [左红波], "The Impact and Countermeasures of Social Media on Our Military's Ideological Work" ["社交媒体对我军意识形态工作的影响与对策"], *Journal of Political Work* [政工学刊], No. 2, 2016.