

Research on Ethical Risks of Algorithms in the Big Data Environment

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Abstract. The social harm caused by algorithmic ethical issues is becoming increasingly serious. The narrowing of public cognition caused by algorithmic addictive recommendations will lead to individual cognitive biases, and algorithmic abuse will infringe on the privacy, security, and data rights of user communities. These have attracted more and more attention. Through research on algorithmic ethical risks, a path for algorithmic ethical governance is proposed to promote the implementation of algorithmic transparency systems, Ensure the comprehensive rights of individual citizens.

Keywords: Big data environment; Algorithm ethics; Social risk; Algorithm transparency

1 Introduction

In recent years, with the rapid development of big data technology and artificial intelligence technology, intelligent algorithm recommendation for the purpose of adapting to personalized needs is becoming a new technological paradigm in the field of information circulation. Online platforms such as Weibo, WeChat, Douyin, Kuaishou and Toutiao have been committed to algorithm transformation and algorithm upgrading. As Clay Scheky puts it: "A technology must become ordinary, then universal, and finally real change will not occur until it is ubiquitous and ignored." Hu Yong, Shen Manlin, trans. Beijing: Chinese University Press, 2009.] .From the current communication practice, the communication changes brought about by intelligent algorithm recommendation are imperceptibly affecting all aspects of social life, naturally hiding ideological risks, and becoming an issue worthy of great attention in maintaining national security and social stability and development.

2A Literature Study on Social Risks and Governance in the Context of Digital Economy

Intelligent algorithm recommendations are changing the information experience and cognitive habits of individual users, as well as the information structure and dissemination order of the entire society. Intelligent algorithm recommendation not only addresses the crisis of information overload and adjusts the matching of information supply and demand, but also brings about an imbalance between tool rationality and value rationality to varying degrees.

How to dialectically grasp the dual impact of intelligent algorithm recommendation, resolve the potential risks of intelligent algorithm recommendation, and guide the orderly and healthy development of intelligent algorithm recommendation has become an important topic of academic research.

2.1 Risk assessment of intelligent algorithm recommendations in different fields

Based on different research fields and theoretical perspectives, scholars have explored the risk characterization of intelligent algorithm recommendations in fields such as politics, society, communication, ethics, and ideology. From the perspective of the evolution of political power, some scholars believe that intelligent algorithms, as a new form of power, have penetrated into various levels of the political field. The inherent flaws and improper use of algorithms pose many risks in areas such as political justice, unclear responsibility subjects, principles of legitimacy, and political judgment. From the perspective of technological ethics, there are many dilemmas in algorithmic technology in news communication, and there is a phenomenon of "value entanglement, interest entanglement, and brand entanglement" in media algorithms. Some scholars have also sorted out the social risks brought about by the alienation of intelligent algorithms from a holistic perspective, such as political attitude differentiation, blind spots in governance, devaluation of public discourse, lack of algorithmic justice, algorithmic technology monopoly, and blurred responsibility subjects.

2.2 Research on Algorithm Transparency and Compliance Issues

Through searching CNKI literature, 75 articles were found using the keyword "big data+algorithm ethics". Karamjit S. Gill (2016) first proposed a data-driven wave of certainty and considered it a moral sustainability issue [1]; Ding Xiaodong (2017) first explored the issue of algorithms and discrimination from the perspective of algorithmic ethics and legal interpretation in the US education equality case. Through analysis of algorithms in several US university enrollment policies, it can be concluded that algorithms are not completely value neutral activities and always imply value judgments [2]; In addition, Wang Yugeng (2019) focused on studying the ethical issues of algorithms and proposed measures such as value embedding, algorithm transparency, and different mechanisms for assuming responsibility based on the ethical issues of algorithms [3]; Cheng Sa (2020) conducted a study on algorithm application and ethical challenges using the American SVOD platform as an example, using giants such as Netflix, Amazon, and Hulu as examples. He believes that the rapid development of these internet-based video subscription platforms is based on big data and algorithm usage. SVOD platforms collect digital traces of audiences on the internet as much as possible, continuously improve recommendation systems, and more accurately push information to audiences [4]; Meng Tianguang et al. (2022) explored the issue of algorithmic governance from the perspective of ethical principles and governance logic of algorithmic risk. Based on domestic and foreign algorithmic governance practices, they elaborated on the four core aspects of algorithmic risk governance and its ethical concerns from the dimensions of "power rights" value and "technology community" path: controllability, transparency, security, and fairness [5]. These researchers believe that while algorithms empower society, they also come with inherent risks such as "information cocoons", algorithmic discrimination, and algorithmic "black boxes" [6]. Therefore, it is necessary to deeply understand the ethical aspects of algorithms in order to establish governance principles for algorithmic risks and build a scientifically effective legal system for computing [7].

To sum up, it can be seen that the academic research on issues related to systemic risk recommended by intelligent algorithms is showing a vigorous development trend, and is shifting from the all-round exploration of empiricism to the critical interpretation of theoretical speculation. From different theoretical perspectives, scholars have discussed the operation logic, practical mechanism, power structure and risk representation of intelligent algorithm recommendation in the fields of politics, society, communication, ethics, law, and culture. It must also be noted that the academic discussion on the issues related to the ideological risk of intelligent algorithm recommendation is still relatively weak, and the research on the ideological risk of intelligent algorithm recommendation and its governance has just begun, and some core issues have not been fully highlighted, and the research on algorithm compliance and algorithm transparency needs to be strengthened.

2.3 Research on Algorithm Transparency and Compliance Issues

Scholars have explored and proposed various governance strategies from their respective research fields on how to deal with the risks of intelligent algorithms. From the perspective of public application risk, we should prevent the systemic risk of algorithms in the public domain from two dimensions: technological regulation and power regulation. In the era of artificial intelligence, research on algorithmic governance and discrimination is receiving increasing attention. Through searching CNKI literature and using the keywords "algorithm transparency+compliance", the search result was 99. Zhang Endian (2023) proposed that in the construction of specific systems, it is advisable to use the theory of relational transparency as guidance and follow the concept of "transparency design"[8]; Kuang Wenbo et al. (2023) believe that the focus is on media security and algorithm transparency in upstream industries, platform governance and privacy protection in midstream industries, and media production and user behavior in downstream industries[9]. Zhao Haile (2023) compared the algorithmic governance rules in the digital economy between the European Union and the United States, and concluded that China's algorithmic governance model is more similar to that of the European Union[10].

3 Investigation and research on social risks and governance in the context of digital economy

In order to understand the public's perception of the social risks brought about by algorithms, a combination of qualitative and quantitative surveys was used to conduct in-depth interviews and questionnaire surveys with experts, and experts in the field of artificial intelligence and algorithm applications were interviewed, and questionnaires were distributed on Internet platforms to conduct questionnaire surveys, and 307 samples were collected.

3.1 Expert interview results

The survey conducted in-depth interviews with two experts, one from the field of artificial intelligence from universities and the other from a technology company, mainly focusing on the ethical risks, privacy and security, information leakage and other issues caused by algorithms in the era of big data, the information cocoon caused by algorithmic addictive recommendation, the cognitive impact of the filter bubble phenomenon on individuals, social

risk governance in the context of big data, algorithm transparency system and transparent standards.

3.1.1 The cognitive impact of information cocoons and filtering bubbles caused by algorithmic addictive recommendations on individuals

The cognitive impact of information cocoons and filtering bubbles caused by algorithmic addictive recommendations on individuals is also significant. This concept is actually very important for the current age of adolescents. Firstly, the information cocoon is caused by algorithmic recommendations that lead users to browse the information they care about, which is the information that users are interested in. There is a filtering mechanism in the algorithm for filtering bubbles, where content that users like is displayed to them and content that they don't like is filtered out. This reduces social information exposure, and coupled with the current lack of platform grading and classification, the impact on user cognition is actually very significant.

3.1.2 Governance of social risks in the context of big data

Governance is necessary for social risks in the context of big data, but it cannot be fully achieved. There are several aspects that need to be noted.

At first, the legal foundation. Now implementing the big data strategy, data is the primary productivity, and it has basically formed a consensus in the entire society. Whether the law is sound is definitely the top priority. If the law is not sound, the risk of sharing big data and integrating across departments will be too high. In addition, after violating the law, the punishment mechanism must be strict. The leakage of data affects the basic rights of citizens and even national security, posing a huge threat.

The second issue is awareness education. The government also needs to carry out data security awareness education for the public, telling them what kind of data is private data, such as highly confidential biological information such as facial biometric information and fingerprints, and under what circumstances are allowed by law to be used. Other than this, it is not allowed by law and needs to be made well-known to everyone.

The third requirement is to have a platform that can be effectively guaranteed from a technical perspective. The unity of platform and tool is also crucial, because the government has a much stronger driving force in social risk control than individuals and enterprises. Therefore, it is best for these platforms to be managed by the government, with the participation of professional departments and technical personnel.

3.2 Questionnaire survey results

In order to fully understand the public's awareness of social risks, the research group conducted a survey on public awareness of social risks in the big data environment using internet platforms. 307 samples were collected, and based on the survey, the level of public awareness can be obtained to a certain extent. In this survey, women accounted for 62% of the respondents, with nearly half of young people aged 18-30, and the vast majority having received higher education, accounting for nearly 86%. Among them, more than three-quarters have received a bachelor's degree or above, indicating that the sample mainly consists of young people with higher education levels. Less than 7% of respondents are very familiar with

the "information cocoon", accounting for a very small proportion. The vast majority of respondents have no knowledge or only know a little about it. However, based on their later experience of using various platforms or websites, most of them believe that they have received homogeneous content recommendations. It can be seen that the proportion of respondents who are in the information cocoon but completely unaware of this situation is very high, It can be seen that the public's basic awareness of the social risks brought by big data is very low, and measures are urgently needed to improve this public awareness and enhance citizens' digital literacy.

3.2.1 Respondents feel that the platform's recommendation based on browsing history is highly recommended

In the survey of the public's browsing habits, nearly half of the respondents will first browse the content they are concerned about or are interested in, more than three-tenths of the respondents will first browse the content recommended by the Internet, and less than one-tenth of the respondents will actively search for it themselves.

In the survey on the intensity of information related to recommendation based on browsing history or search history, Tiktok has the strongest feeling. Nearly 70% of respondents believe that they recommend relevant information based on browsing records or search records. Only about 15% of respondents do not feel or know about it, and Tiktok has a huge user group of nearly 800 million, It can be seen that its traction on the public's information acquisition is already very serious. Baidu ranks second in terms of this strong feeling, which is also another manifestation of information acquisition barriers. As a search engine, Baidu's users are mostly active searchers. However, in addition to the controversial bidding ranking, users also have a strong sense of recommending information based on their browsing and search history. In addition, WeChat official account, The little red book, Station B, Today's Headlines, Kwai, etc. are closely followed by nearly 50% of the respondents who feel very strong. The proportion of respondents who feel that the degree is not high or unclear is mainly Zhihu and WeChat video accounts, accounting for about 20%. As shown in Figure 1.

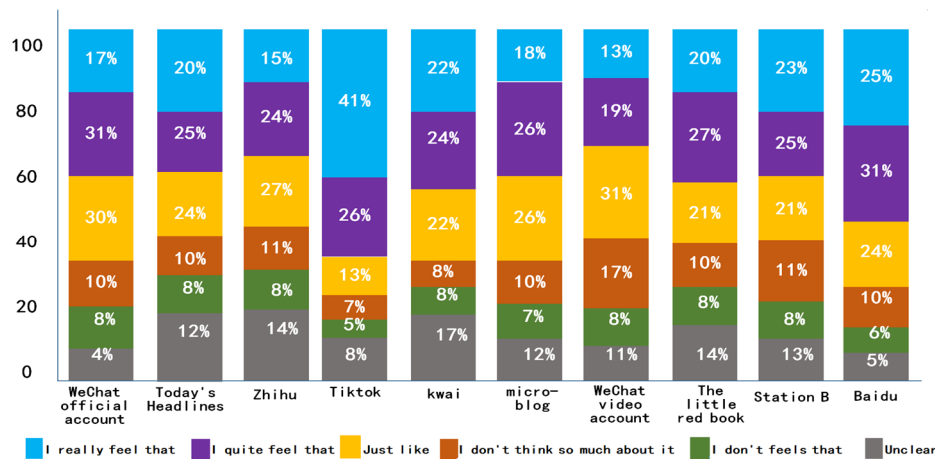


Figure 1: Statistical chart showing the strength of platform recommendations based on browsing history, as perceived by respondents.

3.2.2 Accurate push leads to narrowing of user cognition

The number of young Internet users is still very huge, and they are more obsessed with online content such as short videos. At the age when the worldview is not yet fully formed, the understanding of things needs a variety of objective information as the basis to make correct judgments, but the network recommendation with algorithms as a tool deprives them of the information source channel of comprehensive cognition of things to a certain extent, and only gives them the information they want to hear and see, which is very unfavorable to their growth into a citizen with a sound character, objective cognition, profound thoughts, a fair attitude, a complete personality, and the cultivation of empathy and social responsibility.

The vast majority of users believe that the information pushed by networks or platforms using their technological advantages is too homogeneous. In the attitude survey on the pushed content, the results showed that 38% of respondents agreed with the information content pushed according to their preferences, believing that it could satisfy their interests. However, 55% of respondents believed that the recommended information was too "to their liking", with high repetition and low content quality. It can be seen that more than half of the respondents were not satisfied with the pushed information content; In a survey on the potential impact of the phenomenon of online platforms pushing information based on user preferences, the results showed that 67% and 48% of respondents believed that only browsing topics of their own interest would narrow their horizons and easily lead to cognitive confinement and extreme emotions, respectively. Both were higher than the 43% and 39% who believed that personalized information pushed with a positive attitude could save time and that pushing information in the same direction multiple times could deepen their understanding.

4 The risks and governance approaches brought by algorithms

4.1 The ethical risks brought by algorithms

The survey results show that in the survey of public browsing habits, nearly half of the respondents will first browse the content they are interested in or interested in, more than 30% of the respondents will first browse the content recommended by the internet, and less than 10% of the respondents will actively search on their own. It can be seen that from the perspective of browsing habits, the public puts their own preferences first, followed by passive acceptance of online recommendations caused by laziness, This provides data for algorithms to profile users based on browsing preferences, as well as an excellent opportunity for algorithms to accurately push relevant content based on user characteristics after profiling and labeling. Users continuously receive content of interest recommended by the network based on their own preferences during subsequent browsing, resulting in the received information being influenced by their own preferences, lazy browsing habits, and so on The user profile of algorithms and the precise push of content that users are interested in based on user profiles go through a vicious cycle, causing users to ultimately fall deeply into an "information cocoon" woven together by themselves and algorithms, the phenomenon of information cocoons and filtering bubbles caused by algorithmic addictive recommendations can create a sterile environment for individual users, leading to cognitive narrowing risks and extreme biases. Ultimately, it becomes a puppet in the hands of the capital behind the algorithm, gradually being domesticated and losing the ability to think systematically, posing great ethical

challenges to the public. We should actively explore ways of governance and better apply artificial intelligence technology to the needs of social life.

4.2 Governance of ethical risks brought by algorithms

4.2.1 Enhance public awareness of digital literacy and data security

Firstly, individual citizens need to enhance their digital literacy and security awareness. Users should first consciously and proactively protect the privacy and security of their personal data; More importantly, to overcome stubborn diseases such as the "information cocoon", users need to actively convey positive value orientations to algorithms, work together with artificial intelligence to complete every choice and decision, rather than passively letting algorithms influence our values.

4.2.2 Clarify the ethical and legal responsibilities of algorithms

It is necessary to clarify the ethical and legal responsibilities of algorithms in order to improve the filing and accountability mechanisms for algorithms. In the amendment of the Company Law of China as early as 2005, it was explicitly stated that companies should bear social responsibility. As designers and some users of artificial intelligence products, artificial intelligence enterprises therefore have a particularly heavy responsibility. The 2018 Artificial Intelligence Standardization Forum held in Beijing released the "White Paper on Artificial Intelligence Standardization (2018 Edition)", proposing to study and formulate a standard system for the development of the artificial intelligence industry.

4.2.3 Clarify the generation mechanism of algorithms and their biases

Clarifying the generation mechanism of algorithms and their biases is also necessary, so that enterprises can have targeted regulations, specify ethical standards for algorithm development, and effectively nip foreseeable biases in the algorithm development stage, such as using value sensitive design methods for data ethics concept analysis at the conceptual analysis level, practical analysis at the empirical analysis level, and algorithmic ethics analysis at the technical analysis level; National relevant institutions can, based on the characteristics of specific algorithms, promote targeted efforts to improve algorithm fairness, increase algorithm transparency, and design responsibility mechanisms. For example, in response to ethical issues caused by artificial intelligence technology, an ethical responsibility grading system can be adopted to further refine the ethical responsibilities of each responsible party, and a sound responsibility sharing mechanism can be formulated for joint decision-making.

4.2.4 Strengthen ethical and regulatory oversight of artificial intelligence technology

In addition, it is necessary to strengthen the supervision and authority of government departments, as well as the ethical and normative education of artificial intelligence technology in various universities. Ultimately, algorithms and frameworks that are in line with human laws, social norms, and moral ethics will be created through collaboration among various sectors.

5 Conclusions

The governance of algorithmic ethics should still be based on the public's understanding and recognition of the "information cocoon", and start from reality to provide more popularization to the public. In the era of rapid development of internet information, the use of the internet for the public is ubiquitous, but it also brings many advantages and disadvantages, leading to ethical risks such as cognitive narrowing. Can partition the situation, improve the law, and provide ways to avoid it. With the increasing monitoring, supervision, and crackdown on these phenomena, it is certain that industry operations will become more self disciplined and standardized in the future to promote the construction of algorithmic transparency and fairness mechanisms.

Acknowledgments.The research was supported by a general research project at the school level of Beijing Vocational College of Finance and Trade, titled "Research on Algorithm Ethics Risks in the Big Data Environment" (Project No. BJCZY2023C02), "Research on China's exhibition carbon footprint under the dual carbon background" (Project No. BJCZY2024C01), and a research project on digital education in Beijing for the year 2022, titled "Research on Digital Literacy Standards for Teachers in Vocational Colleges" (Project No. BDEC2022619003).

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