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Understanding Public Concerned Ethic Issues and Ethical Acceptance of AI Surveillance Technology: Analysis from Social Media Data

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Abstract. The accuracy, fairness, and data security of AI surveillance technology have caused a wide range of social discussions. How to guarantee the security of such AI technologies in the application process? This study proposes a computational framework based on machine learning algorithms to extract the public-concerned ethical issues and ethical acceptance of AI surveillance technology from social media data. This study provides a method for the government and enterprises to identify and monitor the public-concerned ethical issues and ethical acceptance of AI surveillance technology. The results can promote the governance and development of AI surveillance technology. This study provides a new research approach and perspectives for AI ethics and governance research.

Keywords. AI surveillance technology, ethical acceptance, AI ethics, AI governance

1. Introduction

AI surveillance technology refers to the technologies that use intelligent biometric algorithms, such as face recognition, action recognition, and emotion recognition, to automatically capture and analyze human behavior, simplify the existing monitoring equipment, enhance its function, and provide better performance. AI surveillance technology has been deployed worldwide [1].

However, in the process of deployment, on the one hand, AI surveillance technology brings efficiency improvement, cost reduction, and security protection. On the other hand, the autonomy of AI surveillance systems makes algorithm decisions gradually replace human decisions, which brings new problems to society, such as algorithm discrimination [2,3] and infringement of rights and interests [4,5]. Concerns about the accuracy, fairness [6], privacy, and data security [7] of AI surveillance technology are gradually emerging. Therefore, the governance of AI surveillance technology is imminent.

However, it is unclear what ethical issues should be considered when governing AI surveillance technologies and how to assess the public's ethical acceptance of AI surveillance technologies. The wide-ranging public discussion triggered by the implementation of AI surveillance technologies provides new ideas for addressing these

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issues.

In general, this study aims to solve the following three problems:

1. How can we extract the public's concerns about AI surveillance technology from social media data?
2. What are the public-concerned ethical issues of AI surveillance technology?
3. How about the public's ethical acceptance of AI surveillance technology?

This paper is structured as follows. First, we discuss the definition and previous research of ethical acceptance and moral foundations dictionary (MFD). Then, we give an overview of the empirical data used for this research. Next, the applied methods to extract ethical issues and calculate ethical acceptance are explained. We end this paper by discussing the results and proposing topics for future work.

2. Literature review

2.1. Ethical acceptance

The ethical acceptance of technology refers to an individual's judgment of whether the technology meets his or her ethical standards, which is expressed through the agreement between personal values and respect for these values after using technology [8]. Social acceptance is similar to the lower level of moral judgment, while ethical acceptance mainly occurs at the top of moral theory [9]. Research has verified that the acceptance calculated through text mining can replace the acceptance measured by the traditional TAM (technology acceptance model) scale [10].

2.2. Moral foundations dictionary

Calculating people's ethical acceptance of AI surveillance technology from text data requires the use of the MFD. The MFD was built in 2009 [11] based on the moral foundation theory. The moral foundation theory points out that no matter how different the cultural background is, there are several groups of moral foundations in people's hearts, which are used to directly judge which things are "good" and which are "evil" [12]. The MFD was subsequently used with a natural language processing program [13] for linguistic survey and word frequency counting to help researchers discover the moral foundations involved in the text.

3. Research method

This paper collects the text data of the public discussion about AI surveillance technology on Weibo and ZHIHU platforms through a Python crawler and analyzes these text data through text mining methods and deep learning algorithms. The research contents of this paper are as follows: 1) using syntactic dependency, HITS (Hyperlink-Induced Topic Search) network sorting algorithm, and word clustering algorithm to get the public-concerned ethic issues of AI surveillance technology. 2) Using PyTorch deep learning framework and LSTM (Long Short-Term Memory) network and its derivative algorithm to calculate and analyze the public's attitude towards each ethical issue and their ethical acceptance of AI surveillance technology.

3.1. Datasets and preprocessing

We crawled the data of public discussions on AI surveillance technology from December 2017 to December 2020. After excluding data samples that did not mention ethical issues, a total of 2885 samples were obtained, including 1069 tweets and 1816 ZHIHU discussions. We then used JIEBA in Python to tokenize the text and remove stop words.

3.2. Feature extraction

Based on the LTP (Language Technology Platform) dependency syntax tool, HITS sorting algorithm, word2vec model, and K-means clustering algorithm, this part carried out feature extraction, sorting, and clustering on the text, and obtained 19 public concerned ethic issues of AI surveillance technology.

3.3. Sentiment analysis

Then sentiment analysis method was used to calculate public satisfaction with these ethical issues. This part was based on the related research work of ABSA (Aspect Based Sentiment Analysis), combined with the PyTorch deep learning framework and LSTM neural network and its derivative algorithm to analyze the sentiment of public concern attributes. The accuracy and F1 value of each model are shown in Table 1. The ATAE_LSTM model performed best. Finally, the ATAE_LSTM model was applied to calculate the aspect-based sentiment of each ethical issue.

Table 1. The accuracy and F1 value of each model

Model	Accuracy	F1 value
LSTM	0.8523	0.7442
TD_LSTM	0.8656	0.7813
TC_LSTM	0.8608	0.7721
AT_LSTM	0.8572	0.7551
ATAE_LSTM	**0.8705**	**0.7908**
IAN	0.8457	0.7505
AOA_LSTM	0.8511	0.7328
CABASC	0.8399	0.7213

3.4. Ethical acceptance calculation

Based on the MFD, the text containing moral foundation words was selected. The sentiment value of the selected text is calculated to obtain the public's ethical acceptance of AI surveillance technology [10,14].

4. Research result

This study provides a computational framework to calculate public-concerned ethical issues and ethical acceptance of AI surveillance technology from social media data. This study reveals nineteen ethical issues that exist in the application of AI surveillance technology, the public's attitude towards these ethical issues, and their ethical acceptance

from 2017 to 2020. This study provides references and suggestions for the governance and regulation of AI surveillance technology and brings new enlightenment to the research of AI ethics.

4.1. Ethical issues and public satisfaction

Public satisfaction with each ethical issue of AI surveillance technology is shown in Table 2. The public is satisfied with the benefit of AI surveillance technology in ensuring security, preventing crime, and improving people's quality of life. The public is most dissatisfied with the threat to autonomy and the power inequality they bring.

Table 2. The public satisfaction of each ethic issue

First category	Second category	Ethical issues	Public satisfaction
Purpose	Intention rationality	Intention rationality	-0.9061
Process	Informed and autonomy	Informed consent	-0.695
		Autonomy	-0.9355
	Privacy protection	Privacy and data security	-0.701
	Technology and algorithm	Algorithmic reliability	-0.504
	User	Ethical users	-0.8194
		Proper use	-0.6682
Result	Risk	Impair physical and mental health	-0.9264
		Aggravate power inequality	-0.9701
		Damage creativity	-0.0027
		Infringement of right	-0.9336
	Benefit	Security and crime prevention	0.3808
		Increase efficiency	-0.1662
		Improve people's quality of life	0.5298
		Technological advancement	-0.5412
		Personalized education	-0.3987
	Risk and benefit equilibrium	Balance of risk and benefit	-0.7399
		Waste of resources	-0.8666
Supervision	Supervision and governance	Supervision and governance	-0.1495

4.2. The change of ethical acceptance over Years

The change in ethical acceptance over the years is shown in Figure 1. The public's ethical acceptance of AI surveillance technology reached its lowest in 2018 and rose slowly in 2019-2020.

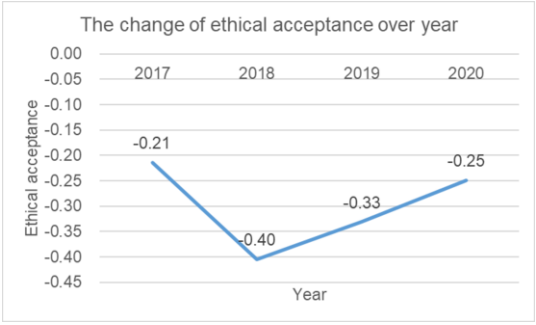

Figure 1. The change of ethical acceptance

5. Conclusion and discussion

5.1. Theoretical implications

The theoretical contribution of this study lies in the following two points:

(1) This study proposed a computational framework to calculate the public's ethical acceptance of AI surveillance technology from social media data. Text mining method based on machine learning algorithms was used to study AI ethics. This study provides a new quantitative analysis method and a new research perspective for the research of AI technology ethics.

(2) Nineteen ethical issues that the public is most concerned about AI surveillance technology have been found, including the motivation, process, results, and regulation of technology use. Ethical issues before, during, and after the use of the technology are considered in all aspects. The ethical issues uncovered in this study are consistent with those concluded by experts through case studies [15,16]. Moreover, this study found some new issues that were seldom mentioned by previous research, such as "ethical users", "unequal rights", "balance of advantages and disadvantages", and "waste of resources". These issues have enlightening significance for AI technology governance.

5.2. Managerial implications

This work helps in security and secure communication by providing a method for the government and enterprises to identify and monitor the public-concerned ethical issues and ethical acceptance of AI surveillance technologies and providing suggestions for the governance of AI surveillance technologies. Through text mining and deep learning algorithms, this study explores the public-concerned ethical issues and ethical acceptance of AI surveillance technology, which has the following management implications:

(1) This study provides a method to monitor the ethical acceptance of controversial AI technologies. Specifically, this study reveals the public's ethical acceptance of AI surveillance technology from social media data. It provides a method for the government and enterprises to identify and monitor the public opinion of controversial AI technologies. The government and enterprises can use this method to monitor whether the public's attitude towards controversial AI technologies has changed to assess whether the regulatory strategy has worked to ensure technology security.

(2) The findings of this paper provide suggestions for government departments, industries, and scientific research institutions to regulate AI surveillance technology and promote its development. 1. Regulators should focus on privacy and data issues, regulation and governance issues, and user and usage issues. 2. The government and enterprises need to manage the risk of AI surveillance technology. At present, the public has a very negative attitude towards the risks brought by AI surveillance technology, such as waste of resources, infringement of rights and interests, a decline of innovation ability, freedom problems, and power imbalance. The government and enterprises need to pay attention to these risks and formulate corresponding regulatory policies to prevent and control risks to reduce the public's concern. 3. While managing AI surveillance technology, it is important to increase public perception of the benefits it may bring. The benefits of AI surveillance technology include ensuring public security, improving citizens' quality of life, increasing efficiency, personalized teaching, and promoting technological advancement.

5.3. Limitations and future directions

This research has several limitations, which can be overcome in future work. Firstly, this study analyzes the Chinese public's ethical acceptance of AI surveillance technology. Future studies can use the method proposed in this study to analyze the public's ethical acceptance of AI surveillance technology in other countries and explore whether cultural differences impact ethical acceptance. Secondly, this study focuses only on AI surveillance technology. Future studies can use the method proposed in this study to analyze the public's ethical acceptance of other controversial AI technologies.

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