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The Impact of Social Media on Public Awareness and Acceptance of Autonomous Driving

Manlin Liu

School of Literature and History, Qiqihar University, Heilongjiang, China

Corresponding author: t34qwert97@tzc.edu.cn

Abstract:

With the rapid development of autonomous driving technology, public awareness and acceptance have become key factors determining its market prospects and social applications. As the primary platform for information dissemination in the digital age, social media serves as the main arena for the formation and spread of public opinion. This study analyzes text data from social media, conducting frequency analysis, network relationship analysis, and sentiment analysis to explore public awareness and attitudes towards autonomous vehicles, represented by the company "Luo Bo Kuai Pao", during the early stages of commercialization. The findings indicate that social media users currently maintain a relatively rational attitude towards autonomous vehicles, but they also express concerns about the potential replacement of traditional taxis and ride-hailing services by this technology. Importantly, this study highlights the need for societal focus on the technological divide between the elderly population, often referred to as "digital immigrants", and autonomous driving technology.

Keywords: Social Media; autonomous vehicles; public awareness; public acceptance.

1. Introduction

With the rapid advancement of information technology, the global automotive industry has entered a period of unprecedented transformation. Intelligent connected vehicles and the transportation sector are becoming strategic high grounds for global technological and industrial revolutions. According to the 53rd *Statistical Report on Internet Development in China* released by the China Internet Network Information Center, as of December 2023, the number of ride-hailing users in China reached 528 million, a year-on-year increase of 30.76% [1]. However, the recent commercialization of autonomous taxis has brought significant structural changes and reshaped the competitive landscape of both ride-hailing and traditional taxi markets. In May 2024, Baidu Apollo launched the sixth generation of its autonomous vehicle, "Luo Bo Kuai Pao", and began large-scale deployment in Wuhan, Hubei. By July, the number of

autonomous taxis exceeded 400, operating from 6 AM to 2 AM, offering rides for only 3.9 yuan for 10 kilometers, significantly lower than traditional taxi fares. As a new technological practice, the application of autonomous vehicles is bound to liberate social productivity. The commercialization of autonomous vehicles marks a "revolution" in the field of driving and transportation, which is sure to provoke enthusiastic discussions among the public, with social media serving as the gathering place for public opinion. Moreover, in the early stages of the commercialization of autonomous vehicles, public awareness and attitudes will directly influence the prospects for their development and promotion.

Despite the maturity of academic exploration and scientific imagination surrounding autonomous driving technology, various issues have emerged in practical applications. On one hand, the innovation and safety of autonomous vehicles face public scrutiny; for example, on July 7, 2024, a "Luo Bo Kuai Pao" autonomous vehicle collided with a red-light-running electric bike at an intersection in Wuhan, sparking public outrage. Some members of the public argue that autonomous driving represents technological progress and a trend that can facilitate daily travel for the elderly, while others express concerns about the associated risks. Additionally, as a new form of labor practice, the competition between autonomous vehicles and traditional drivers has become a heated topic, threatening the employment of many taxi drivers. According to statistics from the ride-hailing regulatory information exchange system, as of April 30, 2024, there were 349 licensed ride-hailing platform companies nationwide, issuing a total of 6.964 million ride-hailing driver licenses [2]. This figure reflects a close association with nearly seven million families and professions.

Based on the above considerations, this study focuses on the critical transition from laboratory simulations to the commercialization of autonomous vehicles, exploring public awareness and attitudes toward this technology. Public perceptions and attitudes reflect their views and opinions on autonomous driving, and understanding these perspectives is crucial for the technology's subsequent development. This research primarily examines public awareness and attitudes toward "Luo Bo Kuai Pao", analyzing specific issues of concern related to autonomous vehicles. Methodologically, this study employs both literature analysis and data analysis. The literature review provides reference ideas for the research, while data analysis allows for keyword and sentiment analysis of public statements, thereby presenting the public's awareness and attitudes toward "Luo Bo Kuai Pao" on social media. This analysis will lay a data-driven foundation for subsequent discussions of the research findings. In summary, the ultimate goal of this study is to analyze the comments made by social media users regarding the "Luo Bo Kuai Pao" incident, revealing public awareness and attitudes during the societal promotion of autonomous vehicles. The study aims to contribute to discussions about this technology at the societal level, promoting the beneficial advancement of technology in society.

2. Research Methods

This study utilizes the "Luo Bo Kuai Pao" incident in Wuhan in July 2024 as a starting point to explore users' awareness and attitudes toward the event on mainstream Chinese social media platforms such as Douyin, Weibo, and Xiaohongshu [3]. The primary methodology employed is data analysis, which can objectively present the emotional attitudes of Chinese social media users regarding the social application of autonomous vehicles. Specifically, in terms of data collection, Douyin, Weibo, and Xiaohongshu are chosen as the data scraping platforms because they are widely used and prominent social media networks in China. The research aims to extract discussions related to autonomous taxis and public opinions concerning taxi drivers from these platforms. For data analysis, keyword frequency analysis and sentiment analysis are employed, allowing for a clear representation of public emotional responses, acceptance levels, and underlying thoughts during the social promotion and application of autonomous vehicles.

The research questions are as follows: First, an analysis of current reports on "Luo Bo Kuai Pao" (autonomous driving services) will be conducted to identify the issues being highlighted and those that need resolution, with a particular focus on the public's foundational awareness and technological imagination surrounding the service. Second, by examining user comments on social media platforms regarding "Luo Bo Kuai Pao", the study will concentrate on the differing perceptions and attitudes across various social groups, aiming to provide audience-level recommendations for the future development of "Luo Bo Kuai Pao" (autonomous driving services).

3. Data Collection

3.1 Keyword Frequency Analysis and Network Relationship Analysis

Data related to "Luo Bo Kuai Pao" was collected from Weibo to extract key terms, and a frequency chart was created based on occurrence rates. The word cloud of comment data is shown in Figure 1, where larger font sizes indicate higher frequencies of the terms in the com-

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ments. Figures 2 and 3 represent the organized results of data collection processed by relevant software.

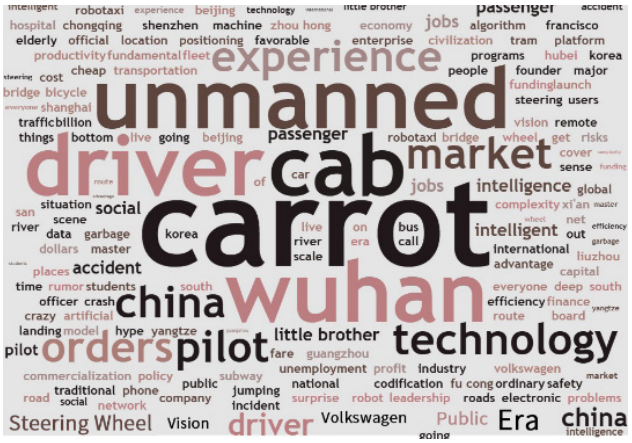

Fig. 1 Word cloud

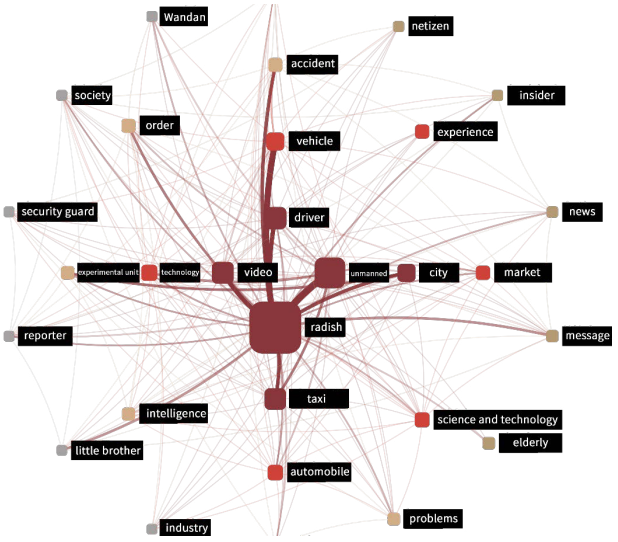

Fig. 2 Network diagram 1

Fig. 3 Network relationship diagram 2

Specifically, Chinese social media users' focus on the "Luo Bo Kuai Pao" incident is concentrated in four main areas: Firstly, regarding technological awareness and social discussion. High-frequency terms such as "Luo Bo" (frequency 8059), "autonomous" (frequency 2525), "automatic" (frequency 1424), and "technology" (frequency 625) frequently appear, indicating that "Luo Bo Kuai Pao", as the first autonomous vehicle applied in China, has garnered significant public attention. This reflects people's interest in autonomous driving technology itself, including its development level, maturity, and future potential. Additionally, terms like "experience" (frequency 462), "technology" (frequency 516), and "artificial intelligence" (frequency 268) indicate that the public has certain expectations for autonomous vehicles. Importantly, the frequent occurrence of „testing" (frequency 203) signifies that the technology is still in the testing and development phase, with media coverage on autonomous vehicles being relatively cautious, and the public maintaining a rational attitude.

Secondly, there is considerable discussion about the "safety and accidents of autonomous vehicles". High-frequency keywords such as "accident" (frequency 457), "death" (frequency 263), and "fatal collision" (frequency 253)

indicate the public's high concern about the safety of "Luo Bo Kuai Pao", particularly regarding accident risks and their consequences. The appearance of "safety operator" (frequency 252) also suggests that the technology is not yet fully mature and requires human assistance to ensure safety.

Next, there is attention to the "market and services related to autonomous vehicles". High-frequency terms like "market" (frequency 469), "service" (frequency 474), and "mobility" (frequency 314) demonstrate that reports also focus on the market dynamics and service implications of "Luo Bo Kuai Pao".

Notably, the frequent mentions of terms such as "Tesla" (frequency 588) and "taxi" (frequency 1180) indicate that autonomous vehicles have sparked considerable public debate regarding their potential to capture the taxi market and impact the automotive sales industry. Finally, there is a focus on the "legal and regulatory aspects" of autonomous vehicles. Although terms like "law" (frequency 40), "policy" (frequency 54), and "government" (frequency 33) appear less frequently, their presence reflects public discussions and concerns regarding the legal and regulatory frameworks for autonomous taxi services. This also underscores the urgent need for the Chinese government to establish policies and regulations to guide the development of the autonomous vehicle industry, as it continues to grow rapidly. Based on the two network relationship diagrams, it can be observed that horizontally, terms such as "Luo Bo", "autonomous", "technology", "city", "pilot", and "market" have the closest relationships. This indicates that there is considerable discussion in society regarding the technology of "Luo Bo Kuai Pao" (autonomous driving services), reflecting public expectations for this technology to be implemented in more cities. Vertically, the terms "Luo Bo", "taxi", "car", "driver", and "accident" are most closely associated. This suggests that there are concerns within society and on social media about the competition between "Luo Bo Kuai Pao" and the taxi industry. Additionally, it indicates that the taxi industry serves as a crucial benchmark for evaluating the safety performance of autonomous vehicles, fundamentally raising discussions about the maturity of autonomous driving technology. Therefore, public discourse around "Luo Bo Kuai Pao" (autonomous driving services) is mixed, encompassing both aspirations and desires for emerging technology and concerns regarding its safety.

3.2 Sentiment Analysis

From Figure 5 (the sentiment analysis scatter plot), it can be observed that discussions among social media users regarding "Luo Bo Kuai Pao" (autonomous driving services) are predominantly neutral, accounting for 60.35% of the sentiments expressed. Positive and negative emotions make up 18.39% and 21.26%, respectively. This indicates that discussions about autonomous vehicles on social media are primarily positive and neutral, reflecting a rational public perception. There is no overwhelming optimism about autonomous vehicles, nor is there excessive worry. Specifically, negative sentiments are mainly centered on the intense competition within the social environment, with comments such as, "If the taxi industry is already becoming saturated, how long will it take for the delivery industry to achieve AI integration?" Additionally, there are complaints regarding various issues encountered by "Luo Bo Kuai Pao" during road operations.

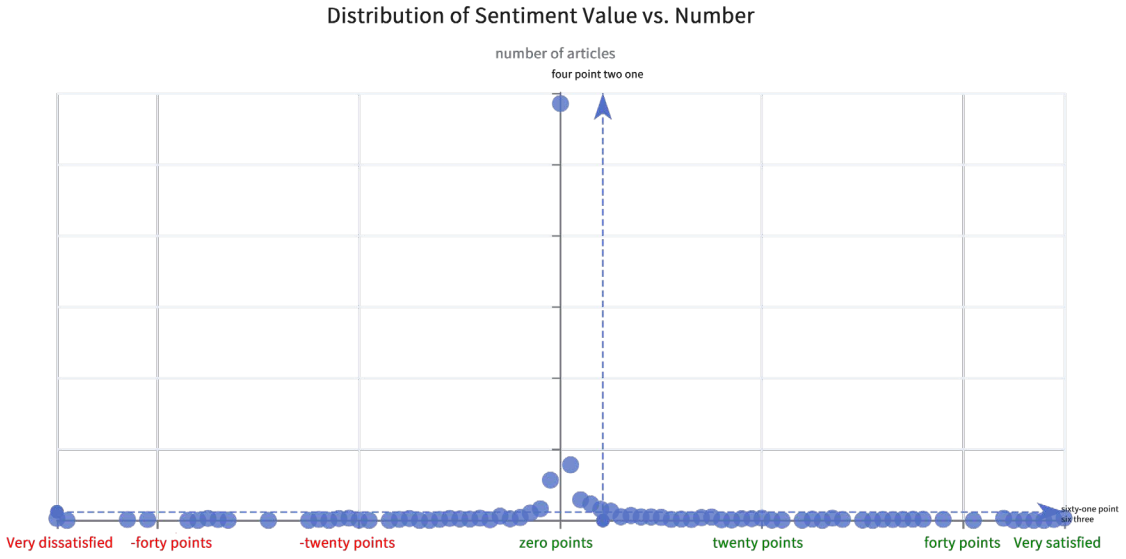

Fig. 4 Sentiment analysis scatter plot

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4. Results Analysis

4.1 Current Issues of Concern

Firstly, regarding safety and accidents. The public on social media expresses significant concern about the safety issues of "Luo Bo Kuai Pao" (autonomous driving services), particularly regarding accident risks and their consequences. This indicates that the technology for autonomous vehicles is not yet fully mature and still requires human assistance to ensure safety. Secondly, in terms of "technology and development", there is a clear public interest in the autonomous driving technology itself, including its level of development, maturity, and future potential. This suggests that technological innovation is an important topic for public discussion. Next, concerning "market and services", on one hand, "Luo Bo Kuai Pao" is perceived positively in its performance and development as a commercial service, with users generally providing good feedback about their experiences. On the other hand, discussions on social media also reflect users' concerns about the competition between autonomous vehicles and traditional taxi services, highlighting an area that relevant industries and departments should pay attention to in the future. Lastly, regarding "legal and regulatory issues", although the frequency of terms like "law" and "government" is low, their presence indicates discussions and concerns about the legal and regulatory frameworks for autonomous taxi services. This suggests that public awareness of legal issues is gradually increasing in China.

4.2 Issues That Need to be Addressed

Firstly, enhancing safety. The top priority is to strengthen research and development to improve the safety and reliability of autonomous driving systems, thereby reducing accident risks [4]. It is also essential to establish a comprehensive incident response mechanism to ensure swift and effective handling in the event of accidents. Secondly, improving legal and regulatory frameworks. Relevant national departments should establish a clear legal and regulatory framework, defining the legal responsibilities and operational standards for autonomous taxi services. Enhanced oversight and evaluation of autonomous driving technology are necessary to ensure compliance with safety standards. Lastly, optimizing user experience [5]. Improving service quality and user experience is crucial for building trust and satisfaction among users of autonomous taxis. This includes addressing potential issues users may encounter, such as difficulties in hailing a ride, unclear pricing, or subpar service attitudes from safety operators, all of which can impact the passenger experience.

5. Discussion

The analysis reveals that discussions on social media regarding "Luo Bo Kuai Pao" (autonomous driving services) have sparked public concerns, particularly among taxi drivers, ride-hailing workers, and even those in the delivery sector. This essentially reflects the classic sociological issue of technological advancement versus occupational decline. While it is important to remain vigilant about these changes, there is no need for excessive worry. Historically, the phenomenon of new technologies undermining existing professions has occurred frequently. It emphasizes the necessity for individuals to enhance their professional skills and adaptability to find their place in the rapidly evolving digital era. Embracing lifelong learning and being open to change can help mitigate the impacts of technological disruption on employment.

In this study, an interesting phenomenon was observed: the connection between elderly individuals and autonomous vehicles is notably strong. This sparked the author's curiosity, and subsequent text analysis revealed that it is largely due to numerous reports on social media showcasing elderly people's "intuitive" reactions to autonomous vehicles. For example, one popular topic discussed an incident where a 77-year-old man from Xi'an was surprised by "Luo Bo Kuai Pao" after riding for a month to see the Yangtze River Bridge [6]. This topic remains highly discussed on social media, reflecting a characteristic of media communication: the "collision" between the elderly and autonomous driving essentially represents a clash between the old and the new. However, a more profound issue emerges: elderly individuals are often completely overlooked by technology in the digital media era. This is not only evident in the autonomous vehicle sector but also highlights the adaptability of digital infrastructure for seniors in China. The transition from the digital divide to the elderly divide indicates that technology not only directly impacts the basic needs of the aging population but also influences their psychological perceptions. How to help elderly individuals adapt to the smart age and avoid becoming "digital remnants" is an ongoing issue that requires sustained reflection in the digital media era.

Regarding autonomous vehicles, this technology offers several advantages for the elderly population. Firstly, it enhances convenience: autonomous taxi services provide a convenient travel option for seniors, especially for those with mobility challenges or who lack driving capabilities. With a simple smartphone app, they can book a ride without worrying about driving or parking, significantly improving travel convenience. Secondly, it ensures safety: safety is a primary concern for elderly individuals. Autonomous driving technology theoretically offers a safer

travel experience by reducing risks associated with human error and driver fatigue. However, it is also essential to strengthen technical training and safety education to ensure that seniors can use autonomous taxi services correctly and understand any potential risks involved. Lastly, it has social and psychological impacts: autonomous taxi services can help seniors maintain social activities, reducing loneliness and social isolation due to mobility challenges. Nonetheless, attention should also be given to potential psychological resistance or adjustment difficulties that seniors may experience with new technologies. Providing necessary support and assistance is crucial to facilitate their adaptation.

6. Conclusion

This study uses the "Luo Bo Kuai Pao" incident as a case example to explore users' opinions on autonomous vehicles on major Chinese social media platforms, including Douyin, Weibo, and Xiaohongshu, employing keyword and sentiment analysis methods. The findings reveal that, firstly, the current focus of public attention in China regarding autonomous vehicles primarily centers on four aspects: the safety of autonomous vehicles, market and service issues, the technology itself, and the corresponding legal and regulatory frameworks. This indicates a general concern among the public about autonomous vehicles, with online discussions covering various social issues related to this technology. Secondly, regarding the public's attitude toward autonomous vehicles, the overall perception remains rational and objective, without significant emotional fluctuations. Lastly, this study further confirms the "digital divide" faced by the elderly in the digital age, identifying them as a "lagging generation" in relation to advanced autonomous vehicle technology. It underscores the need for society to enhance digital support for the aging population in the future.

At the same time, this study has certain limitations. For example, it does not delve further into the specific orientations and biases in public perception and attitudes, which highlights a methodological limitation of this research. Future studies could adopt qualitative methods to conduct an in-depth investigation into the relationship between autonomous vehicles and public perception and attitudes. Additionally, while addressing the immediate technical and social issues of autonomous vehicles, it is crucial to focus on promoting and disseminating this technology among the elderly. Further research should examine the impact of autonomous driving technology on seniors' mobility and implement measures to ensure convenient and safe travel for the elderly, thereby contributing to bridging the digital divide for this population.

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