Last Week with ChatGPT: A Weibo Study on Social Perspective regarding ChatGPT for Education and Beyond

Yao Tian*, Chengwei Tong*, Lik-Hang Lee, Reza Hadi Mogavi, Yong Liao, and Pengyuan Zhou

Abstract-ChatGPT has piqued the interest of many fields, particularly in the academic community. GPT-4, the latest version, starts supporting multimodal input and output. This study examines social media posts to analyze how the Chinese public perceives the potential of ChatGPT for educational and general purposes. The study also serves as the first effort to investigate the changes in public opinion since the release of GPT-4. According to the analysis results, prior to GPT-4, although some social media users believed that AI advancements would benefit education and society, some believed that advanced AI, such as ChatGPT, would make humans feel inferior and lead to problems such as cheating and a decline in moral principles, while the majority remain neutral. Interestingly, public attitudes have tended to shift in a positive direction since the release of GPT-4. We present a thorough analysis of the trending shift and a roadmap to ensure the ethical application of ChatGPT-like models in education and beyond.

Index Terms—Artificial Intelligence (AI), ChatGPT, Large Language Model (LLM), Chatbots, Education, Ethics, Human-Computer Interaction.

I. INTRODUCTION

► HATBOTS can understand natural language input and respond in a human-like manner, making them ideal for tasks such as answering questions, providing guidance, and even offering emotional support. In customer service, chatbots can handle common problems and provide support and guidance. Cui et al. [1] introduced SuperAgent, which is cost-effective when answering repetitive questions, freeing up human support staff to answer more complicated questions. In online shopping, Chatbot can help users find interesting products and recommend related products. [2] confirmed that anthropomorphism plays a positive role in shaping consumers' intentions to purchase through chatbot commerce. In the medical field, chatbots serve as medical manuals to help patients become aware of their illnesses and improve their health. Text diagnosis bot enables sufferers to join in analyses of their medicinal matters and present a personalized analysis report about the symptoms [3]. Meanwhile, research on the

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*Chengwei Tong and Yao Tian contributed equally to this work. Pengyuan Zhou is the corresponding author. application of chatbots to education and other areas is still in its infancy [4] and waits for more exploration.

On November 30, 2022, OpenAI released ChatGPT [5], a large language model (LLM), which enables realistic conversations with humans, sequential inquiries, faulty dispute premises, and rejects unsuitable requests. ChatGPT can also generate original content like songs, scripts, and code, and even imitate different personas to interact with provided premises. OpenAI elevated ChatGPT's capabilities to the next level with the release of GPT-4 in March 2023 [6]. GPT-4 is a big multimodal model that accepts image and text input and generates accurate text output. Experiments indicate that GPT-4 performs at a human level on a variety of professional and academic standards [7]. For instance, it passed the simulated bar exam and ranked among the top 10% of test-takers, whereas GPT-3.5 ranked among the lowest 10%.

The verdict is still out on whether ChatGPT will pass the Turing test [8] in the future. Still, its strong powers are expected to alter many aspects of our life, especially education, where GPT-4's image recognition capability is the most remarkable feature. For instance, if you present it with a physics question and an image, it will comprehend the question and produce the correct response. Microsoft has further implemented GPT-4 into its product Microsoft 365 Copilot [9] to aid customers in accomplishing a variety of tasks through dialogue, considerably enhancing productivity. However, may this also result in inertia and a decline in human learning abilities?

This study investigates individuals' views and perspectives on ChatGPT applications in various fields, such as education, human-computer collaboration and interaction. We gathered data from Sina Weibo, China's biggest microblogging website and app with 573 million monthly active users, using keywords related to ChatGPT across various contexts. Using the collected data, we conducted sentiment and topic analysis across diverse cases. Our results indicate that Chinese social concerns differ across different scenarios. Negative attitudes outweighed positive ones, although attitudes slightly improved after the release of GPT-4. Therefore, it is essential to thoroughly consider the positive and negative effects of ChatGPT and implement feasible strategies to optimize pros and minimize cons, ensuring safe and responsible utilization.

The remainder of this paper is organized as follows. Related works are discussed in Section II. Section III presents our data collection strategy and statistics, and analysis tools. Our experimental results and analysis are illustrated in Section IV.

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TABLE I

BRIEF INTRODUCTION OF SOME ARTICLES AND THE DISTINCTIONS IN OUR WORK

Papers	Brief Introduction
Mogavi et al. [10]	This article analyzed data from Twitter, Reddit, YouTube, and LinkedIn to explore the user experience and perspectives of early adopters toward ChatGPT in various education sectors.
Baidoo-Anu et al. [11] Kasneci et al. [12]	This review synthesized recent extant literature to offer some potential benefits of ChatGPT in promoting teaching and learning. This commentary presents the potential benefits and challenges of educational applications of LLMs, from student and teacher
Rudolph et al. [13]	This review adopts a desktop analysis approach and conducts an extensive literature review, focusing on ChatGPT's implications for higher education.
Zhai [14]	This study piloted ChatGPT to write an academic paper and reflected on the potential impacts of AI tools on education based on the user experience.
Tlili et al. [15]	This study collected and analyzed Twitter data, and examined ChatGPT in education among early adopters through a qualitative instrumental case study.
Kung et al. [16]	This article evaluated the performance of ChatGPT on the United States Medical Licensing Exam and suggested that LLMs may have the potential to assist with medical education and clinical decision-making.
Rahman et al. [17]	This article collected data from published articles, websites, blogs, and visual and numerical artifacts, and found that ChatGPT is effective for generating initial ideas for academic scientific research, but challenges may arise for tasks like literature synthesis, citations, problem statements, research gaps, and data analysis. They argue that necessary guidelines should be established for the appropriate use of LLMs.
Bahrini et al. [18]	This article reviewed the existing literature, and examined the applications, opportunities, and threats of ChatGPT in 10 main domains, providing detailed examples for the business and industry as well as education.
Liu et al. [19]	This article performed an in-depth analysis of 194 relevant papers on arXiv, and the findings reveal a significant and increasing interest in ChatGPT/GPT-4 research.
Our article	Our article differs in the following ways: 1) we collect data from the No.1 Chinese social media, Weibo, which serves as a unique public opinion environment and data source of Chinese society that has not been explored; 2) we compare the people's attitudes and opinions before and after the release of GPT-4; 3) we expand the investigation to more interactions scenarios beyond education.

Section V compares the differences between our results and those of other studies and analyses possible reasons. Finally, we provide a conclusion in Section VI.

II. RELATED WORK

Previous studies have explored various aspects of the application of ChatGPT in different fields, and their findings provide valuable insights into the potential benefits and challenges of this technology.

Education is one of the most direct and widely engaging application fields for ChatGPT, with a broad audience and easy deployment. Mogavi et al. [10] collected and analyzed data from four major social media platforms (i.e., Twitter, Reddit, YouTube, and LinkedIn), revealing that the public discourse in social media is generally positive, and there is enthusiasm regarding its use in education. However, they also found that overreliance on the AI system may promote superficial learning habits and erode students' social and critical thinking skills. Baidoo-Anu et al. [11] argue that ChatGPT can analyze students' learning preferences, strengths, and weaknesses, provide personalized tutoring and feedback to students, and can also be trained to grade assignments, giving teachers more time to focus on other aspects of teaching. However, there are concerns regarding the lack of human interaction provided by generative models such as ChatGPT, which may not be suitable for students who require a personal connection with their teachers to enhance their learning experience. Kasneci et al. [12] believe that ChatGPT can provide customized services for learners at different stages and fields, but customizing models to specific needs, addressing bias in specific use cases, and dealing with ethical issues and copyright issues require multidisciplinary evidence-based research and evaluation. Rudolph et al. [13] advise against a regulatory approach that focuses

on discovering academic misconduct, such as detecting the use of ChatGPT and other AI tools. They favor an approach that builds trusting relationships with students in a student-centric pedagogy and assessments for and as learning. Zhai [14] showed that ChatGPT could help researchers write a paper that is coherent, (partially) accurate, informative, and systematic, and suggested adjusting learning goals—students should be able to use AI tools to perform scientific research tasks, improving creativity and critical thinking, rather than focusing on general skills.

Apart from education, the application values and prospects of ChatGPT and other chatbots in different fields have also been investigated. Bahrini et al. [18] have examined the applications, opportunities, and threats of ChatGPT in 10 main domains, providing detailed examples for the business and industry as well as education, while Liu et al. [19] have furnished insights into ChatGPT's capabilities, potential implications, ethical concerns, and offer direction for future advancements in this field. Skjuve et al. [20] interviewed 25 participants over a 12-week period to understand how their human-chatbot relationships (HCRs) formed with chatbot and found that the HCRs formed gradually and mostly in line with the assumptions of Social Penetration Theory [21]. Lee et al. [22] found that chatbot-based social contact has promising potential for mitigating mental illness stigma and provides suggestions on how human-AI interactions can be designed to promote positive social impacts.

Meanwhile, we find that there lacks a thorough study of the opinion of Chinese society, the 2nd largest AI market¹, on the ChatGPT-alike models. Moreover, the impact of GPT-4 on social perspective also remains overlooked. Finally, drawing upon our data and relevant references [23], [24], [25], we

¹https://www.idc.com/solutions/data-analytics/spending-guide

present several recommendations to enhance AI inclusiveness, encompassing aspects such as data sources, developer teams, and user communities. These recommendations aim to ensure equitable participation and benefit for all individuals in the realm of AI.

Generally, the distinctions between our article and other comparable articles are presented in Table I.

III. METHODS

This study explores the potential of ChatGPT from various perspectives by analyzing individuals' attitudes and perceptions of its usage on social media platforms.

As one of China's largest social media platforms, Weibo has hundreds of millions of active users who share their lives and thoughts on it. After the release of ChatGPT and GPT-4, discussions regarding them on Weibo have been so intense that they have made it to the trending topics multiple times. This demonstrates that people in China are highly intrigued by this groundbreaking technological advancement. To reduce time and manual costs, we have utilized some of the related functions of WeiboSuperSpider [26], a Weibo spider and supporting toolbox that enables one-stop Weibo spider data collection, analysis, and visualization.

To gather attitudes towards ChatGPT, we combined different keywords with the universal keyword "ChatGPT" and crawled all relevant post contents from the time of ChatGPT's release (November 30, 2022) until the eve of GPT-4's release (March 14, 2023). Then, we collected relevant posts from GPT-4's release (March 15, 2023) until May 4 to represent attitudes towards GPT-4. Note that we did not filter out repeated or reposted posts from different users, as we believe this can also be an expression of the user's attitude. By comparing the data and results from the two phases, we can also explore whether powerful AI represented by GPT-4 has caused a change in attitudes. The number of posts we collected from Weibo using the above method is shown in Table II.

More specifically, we first performed data cleaning after data collection by eliminating certain elements frequently encountered in posts, including user mentions (@) or links, and redundant words like "Collapse" commonly present in lengthy Weibo posts as an initial step. We combined strongly related keywords and divided them into multiple scenarios to explore the advantages, drawbacks, and potential risks of ChatGPT in different scenarios with a finer granularity. This approach is more valuable than analyzing data under a single keyword. After that, we conducted sentiment analysis on each Weibo post using [27], labeling the sentiment probabilities and categorizing them as positive, negative, or neutral, and performing statistical analyses on the obtained results. We subsequently utilized the LDA model [28] to analyze which topics people were concerned about in Weibo posts. To analyze attitudes and perspectives effectively, we kept adjectives and adjectival nouns as these words can convey a certain level of evaluation, excluded potentially confusing vocabulary, and used LDAvis[29] for data visualization. Then we combined the results with corresponding Weibo content to obtain an overview of general perspectives and attitudes towards the corresponding scenarios.

TABLE II THE NUMBER OF POSTS COLLECTED AFTER CLEANING

Keywords	Before the Release	After the Release
AI	30285	24128
Artificial Intelligence	35869	16934
Human-Computer Collaboration	74	19
Human-Computer Interaction	964	300
Education	6301	3109
Examination	1940	1335
Originality	148	48
Cheating	1577	141
Homework	5138	1491
Paper	8318	3230
Q&A Skills	64	26
Answering questions	132	81
Moral Ethics	208	142
Law	1675	1944
GPT-4	-	21976
Copilot Office	-	1074
New Bing	-	2153

By examining users' attitudes and comments towards Chat-GPT, this study can help professionals and policymakers who use or plan to use this technology understand the strengths and limitations of ChatGPT and make informed decisions.

IV. RESULTS AND ANALYSIS

This section provides an in-depth analysis and discussion of the collected data. We first look at the overall view of ChatGPT applied to education, while specifically analyzing three subscenarios to dig deeper into opinions and attitudes about applying ChatGPT to education, and explore why people hold different views. Then, we discuss the relationship between AI and human collaboration and explore the future prospects of AI applications.

A. ChatGPT and Education

We conducted an overall sentiment analysis of Weibo texts regarding "ChatGPT" and "education". The results show that most people are cautious about using ChatGPT in education, with 82.5% of individuals holding a neutral attitude. This highlights that the potential of ChatGPT's application in education is limited by social awareness and comprehension. Meanwhile, we observe that some individuals negatively perceive Chat-GPT's implementation in education, accounting for 15.3% of the sample. Their concerns include the fear of ChatGPT replacing the role of human teachers or stifling students'



Fig. 1. Sentiment analysis of "ChatGPT and Education". (a) Before the Release. (b) After the Release.

500

Simple

Abnormal

Highest

Safe Continuous

> Hot Huge Old

Powerful

Favorable

Forever

Bigger Love

Pricey

Fixed

Not Bad

Mature

Notable

Strong

Max

Weak

Advanced Clear



Fig. 2. Top-30 Most Salients Terms of "ChatGPT and Education". (a) Before the Release. (b) After the Release.

creativity. Only 2.3% of the individuals hold a positive attitude towards ChatGPT's implementation in education, likely due to the early stages of research and application in this field.

(a)

After analyzing the Weibo texts following the release of GPT-4, we notice a near doubling of the proportion of positive attitudes, reaching 4.4%, while the proportion of negative attitudes decreases slightly to 12.1%. The advancement and improvement of GPT-4 compared to its predecessor may give people a better understanding of the potential advantages and limitations of ChatGPT, bringing more confidence and optimism to users. Individuals who were initially skeptical or reserved about using ChatGPT may have become more openminded to its use in education, resulting in this attitude change.

Topic analysis reveals that, in Weibo posts discussing ChatGPT and education, the term "**simple**" appears much more often than other words, indicating that people may have high expectations that ChatGPT will simplify education. Traditional education models require a significant amount of time and effort for students to understand and master knowledge, whereas ChatGPT can provide intelligent learning guidance, making learning more efficient and convenient. After the release of GPT-4, the distribution of topic words became more balanced, with "important", "thoughtful", and "different" becoming high-frequency words. This may suggest a deeper awareness of the potential implications and a call for thoughtful implementation strategies. Users begin to emphasize the need to carefully consider ethical, pedagogical, and practical aspects of integrating ChatGPT into educational practices.

Keywords such as "safe" and "healthy" also appear frequently, reflecting concerns about the potential negative impacts of ChatGPT's implementation in education. Some individuals worry that the widespread use of ChatGPT in education can lead to students becoming too dependent on AI and ignoring the development of their own abilities, which may increase students' psychological pressure and negatively affect their physical and mental well-being.

Overall, the potential of using ChatGPT in education is not yet fully recognized. Next, we explored three typical education scenarios.

1) Scenario 1-Examination and Cheating: ChatGPT can generate fluent textual responses and explanations to questions, which leads people to believe that it can serve as an auxiliary tool in exam preparation. Experimental results have shown that GPT-4 performs at a level comparable to that of humans in various professional tests and academic benchmarks. For example, it has passed a simulated lawyer exam with a score that ranks among the top 10% of candidates [7]. However, this also brings the risk of cheating. In exam and cheating scenarios, the proportion of individuals who view ChatGPT negatively is significantly higher than those with a positive attitude, reaching 41.7% before the release of GPT-4. This indicates that people are extremely worried that ChatGPT may be used for cheating and undermine the fairness of exams. Following the release of GPT-4, this proportion dropped to 23.5%, and the proportion of positive attitudes increased from 2% to 5.8%. This could be because, as people become more familiar with ChatGPT, some schools and institutions have started using countermeasures to identify and prevent cheating, which helps reduce concerns and influence their attitudes.

(b)

The results of the topic analysis further support the differential attitudes of netizens towards the use of ChatGPT in exams. While it is commonly believed that ChatGPT can improve students' test scores by facilitating exam preparation and reviewing sessions, as evidenced by high-frequency positive



Fig. 3. Sentiment analysis of "Examination and Cheating". (a) Before the Release. (b) After the Release.



Fig. 4. Top-30 Most Salients Terms of "Examinations and Cheating". (a) Before the Release. (b) After the Release.

terms such as "powerful" and "important" both before and after the release of GPT-4, there are also apprehensions about the potential negative implications of ChatGPT utilization. Indeed, the concerns raised by high-frequency negative terms, including "hurt", "complicated", and "anxiety", indicate a sense of uncertainty and anxiety surrounding the use of ChatGPT for academic purposes, with fears about potential risks to examination fairness and students' integrity.

We have exemplified some points of view in Table III to show that ChatGPT is a double-edged sword. While some individuals have voiced their concerns about cheating or intend to exploit ChatGPT for fraudulent purposes, others opine that the application of ChatGPT can enhance students' comprehension of complex questions and concepts. Thus, the use of ChatGPT in the testing set possesses both merits and demerits, necessitating more comprehensive evaluations of its potential impact and role.

 TABLE III

 COMMENTS ON CHATGPT IN EXAM AND CHEATING SCENARIOS.

Attitude	Content
Negative	In the new semester, teachers have started to get a headache about how to prevent students from cheating with ChatGPT writing assignments and reports, which is too difficult.
Neutral	I just want to know if I can use ChatGPT to answer during
Positive	#ChatGPT# used 1 month to help my child's English score improve by a large margin and the test was very easy.

2) Scenario 2-Assisting with homework: ChatGPT can play the role of a virtual teacher, helping students understand assignment requirements, improving writing skills, and even providing direct answers. Regarding using ChatGPT for homework assistance, it is worth noting that there has been little change in the proportion of negative attitudes following the release of GPT-4. However, the proportion of positive attitudes increased from 4.7% to 17.8%, a growth rate that exceeds all other scenarios. We believe that this might be due to the fact that using ChatGPT to assist with homework is the most direct and common scenario in which ChatGPT is applied in education. The functionality enhancement of GPT-4, combined with the experience accumulated by users in previous use, has enabled students to have a better experience when using ChatGPT to assist with their homework, thus increasing their confidence and positive evaluations of it. In addition, positive word-of-mouth and recommendations from peers may have a positive impact on students' attitudes. When students see their peers achieving positive results on homework by using ChatGPT, this social influence can inspire others to adopt similar practices, thereby promoting a positive attitude.

Similar to the previous cheating scenario, in this scenario, the keywords that contribute the most to the topic, such as "powerful", "perfect", and "successful", represent expectations and recognition of using ChatGPT to solve homework difficulties and improve learning efficiency. Terms like "complicated", "danger", and "hurt" indicate concern about the potential harms of using ChatGPT for homework purposes. It is worth noting that such negative words have significantly decreased on Weibo after the release of GPT-4, corresponding to the significant increase in the proportion of positive attitudes mentioned above.

Table IV exemplifies several perspectives on Weibo. Regardless of possible benefits such as enhanced comprehension, improved answering skills, and error reduction, some individuals opine that excessive dependence on ChatGPT may



Fig. 5. Sentiment analysis of "Assisting with homework". (a) Before the Release. (b) After the Release.



Fig. 6. Top-30 Most Salients Terms of "Assisting with homework". (a) Before the Release. (b) After the Release.

compromise students' capacity to learn autonomously. It may potentially diminish their curiosity and passion for learning, leading to laziness and stunted creativity. Consequently, they miss out on the invaluable opportunity to explore, experiment, and discover through learning independently.

 TABLE IV

 COMMENTS ON CHATGPT IN ASSISTING WITH HOMEWORK SCENARIOS.

Attitude	Content
Negative	This software really achieves the ultimate in AI. It is too intelligent, and long-term use will naturally reduce people's thinking and creativity. If the information provided by Chat- GPT is wrong it will mislead the direction of public opinion
Neutral Positive	ChatGPT is good for homework, but not so feasible for work. I love chatting with ChatGPT so much, not only can it infer the typos I made, but I can also learn its logic when answering questions and its skills when answering vague questions.

3) Scenario 3-Paper and Originality: Many paper assistance tools have emerged since ChatGPT was released. The ChatGPT Academic [30] project customizes a comprehensive set of practical functions based on ChatGPT for optimizing academic research and daily work. The built-in tools include but are not limited to academic paper polishing, quick translation between Chinese and English, and one-click code interpretation. ChatPaper [31] can automatically download the latest papers on ArXiv based on the keywords entered by users, and then use ChatGPT's API to summarize the papers into a fixed format, providing users with the maximum amount of information with the least amount of text and the lowest reading threshold. ChatResponse [32] is an AI assistant that generates author responses based on reviewer comments. It automatically extracts questions and concerns from the reviewer's comments and generates point-to-point responses. These tools demonstrate people's enthusiasm and active exploration of applying ChatGPT in paperwork. We can see from the sentiment analysis that although the proportion of negative attitudes is still higher than that of positive attitudes, the relative gap between the two is lower than in the previous two scenarios. The proportion of positive attitudes increased

to 15.0% after the release of GPT-4, and it is the only one that exceeds half of the proportion of negative attitudes in our examined education-related scenarios.

The results of the topic analysis in this scenario show that the proportion of the word "simple" is the highest. After the release of GPT-4, other positive words such as "perfect" have increased, which also reflects the promoting effect of GPT-4 on people's attitude towards positivity and expectations for the application prospects. We can foresee that the development of such paper assistance tools in the future will become increasingly popular, and their application will also become more widespread.

Based on the opinions listed in Table V, it can be observed that some people believe that the content generated by ChatGPT is nothing more than training data inputted by humans, lacking in thinking ability and originality. Research by Nicholas Carlini et al. has confirmed the existence of memorization in LLMs, and the amount of memorization will increase with larger model sizes. For example, the 6 billion parameter GPT-J model [33] memorizes at least 1% of its training dataset: The Pile [34]. Although ChatGPT can provide guidance on papers from various aspects such as providing ideas and modifying sentences, some people seem to spend too much time seeking help from ChatGPT, which may lead to a decrease in individual thinking and analytical abilities. Additionally, many users including us have found that the



Fig. 7. Sentiment analysis of "Paper and Originality". (a) Before the Release. (b) After the Release.



Fig. 8. Top-30 Most Salients Terms of "Paper and Originality". (a) Before the Release. (b) After the Release.

content generated by ChatGPT is sometimes "too original", resulting in fabricated references and links that do not exist. OpenAI needs to address this issue in the version iteration of ChatGPT, ensuring that the model generates original content while maintaining reliability.

 TABLE V

 COMMENTS ON CHATGPT IN PAPER AND ORIGINALITY SCENARIOS.

Attitude	Content
Negative	#chatgpt# This AI is a bit overblown. Its thinking ability is insufficient, and the content it generates lacks originality. It spits out whatever humans feed it.
Neutral	I wrote my paper for 3 hours, two and a half of which were spent talking to ChatGPT.
Positive	#ChatGPT# I feel that it is very useful for summarizing and refining the main points. It can also give you a general outline to provide ideas for your paper. But a lot of references are made up. I heard that gpt4 had changed this point and is more intelligent.

4) Summary: The first part of this study aims to investigate the views on the utilization of ChatGPT in education through social networks. We used keywords such as "education", "exam", "homework", or "paper" in combination with "Chat-GPT" to search for related content on Weibo, and conducted sentiment and topic analysis for three typical scenarios. Our research results show that despite the differences between the scenarios, most people maintain a neutral attitude, and the proportion of negative attitudes is significantly higher than that of positive attitudes. Following the release of GPT-4, the percentage of neutral attitudes on social media decreased, the percentage of negative attitudes in different scenarios more or less decreased, and the percentage of positive attitudes increased. This indicates that people are generally cautious about new technologies, and are concerned about the various problems they may bring. In light of GPT-4's multi-modal processing capabilities [6], more people recognize the increasing potential and application values of ChatGPT. This enhanced awareness of ChatGPT's advantages and drawbacks has led to more people expressing positive attitudes. Remarkably, when discussing the practical applications of ChatGPT in the education sector, even though GPT-4 has increased the proportion of positive attitudes, it is still lower than the proportion of negative attitudes. Therefore, it is essential to focus on and resolve concerns. We expect that OpenAI can further enhance the GPT technology while reducing its potential risks, and relevant authorities also need to formulate regulations for supervision.

B. AI and Human

The topic of artificial intelligence (AI) has attracted considerable interest in recent years because of its ability to transform the way in which humans interact with computers. Developing advanced AI models such as ChatGPT and GPT-4 has further stimulated this interest and sparked a lively debate. These models have also drawn significant attention from the AI research community for their impressive performance and capabilities. In this second part of our analysis, we aim to explore the relationship between a powerful AI system like ChatGPT and human beings.

While analyzing the dataset, it is necessary to acknowledge the significant difference in the number of posts related to different keywords. As can be seen from Table II, the keyword "AI" has 54,413 related posts in total, while the Chinese keyword "Artificial Intelligence" has 52,812 related posts. In contrast, only 1264 posts discuss "human-computer collaboration", and "human-computer interaction" has a mere 93 posts. Therefore, conducting a comprehensive analysis of the entire dataset for this section may not be necessary. However, we can still gain valuable insights into the relationship between a powerful AI system such as ChatGPT and human beings by focusing on relevant posts within the dataset.

1) Scenario 1: Artificial Intelligence: In recent decades, numerous movies and novels have depicted scenarios where AI takes over the world. Although these portrayals often involve artistic liberties and exaggerated elements, they reflect the growing power of AI gradually has an impact on people's daily lives. This development prompts questions about the public's

attitudes toward the launch of advanced AI systems such as ChatGPT.

Figure 9 shows the results of our data analysis, which reveals that most people express a neutral sentiment towards AI and ChatGPT. This finding may indicate a lack of strong positive or negative attitudes towards these subjects or suggest that people are simply reposting content without much thinking. This phenomenon could be attributed to various factors, such as a lack of knowledge or understanding about ChatGPT, or it could be a reflection that people recognize both these technologies' potential benefits and drawbacks.

Notably, 18.2% of people hold a negative sentiment towards AI and ChatGPT, indicating concerns or criticisms. These negative attitudes may stem from fears about job loss, privacy concerns, or a general mistrust of AI and machine learning algorithms. Moreover, the corpus used to train these models could still contain harmful and toxic materials despite efforts to avoid them.

On the other hand, the fact that 7.6% of people express a positive sentiment towards AI and ChatGPT suggests that some individuals recognize these technologies' potential benefits. These benefits could include increased efficiency in particular tasks, more personalized user experiences, and scientific research and development advancements.

Interestingly, our data show that GPT-4 has drawn more attention than ChatGPT-3, as evidenced by a decrease in the



Fig. 9. Sentiment analysis of "Artificial Intelligence". (a) Before the Release. (b) After the Release.



(a)

percentage of neutral sentiment following its release. Apparently, the release of this potent AI tool has heightened people's comprehension and knowledge of its abilities, inciting them to express their positive or negative opinions on social media platforms such as Weibo. This could be attributed to several factors, including GPT-4's multi-modality functionality, which enables it to receive and produce images as well as text, expanding its applicability to a broader range of fields, such as image recognition and analysis, and web design, among others. Furthermore, GPT-4's launch was accompanied by the introduction of New Bing and Copilot Office, which exposed GPT-4 to a larger audience. This suggests that as ChatGPT continues to develop and integrate into lives, more individuals will become aware of its potential uses and the associated risks and dangers, leading to a more nuanced range of attitudes towards the technology.

ChatGPT has also elicited a range of opinions among people. As demonstrated in Figure 10, prior to the release of GPT-4, the words "important", "powerful", "simple", and "hot" were frequently employed as evaluative words by individuals. Even after its release, "important", "powerful", and "hot" remain prominent. We can infer that some do perceive it as an essential and powerful tool that can simplify complicated problems and improve efficiency and productivity across industries, which we will discuss in the next scenario. However, following the release of GPT-4, there is a noticeable increase in the frequency of the word "safe". This may indicate that individuals have become more skeptical and express concerns regarding the potential impact of AI on human intelligence, especially after witnessing the capabilities demonstrated by GPT-4. The ongoing debate following the release of ChatGPT is focused on ensuring its safety and trustworthiness, requiring continued research, development, and regulation from policymakers. As such, it is imperative for AI developers and policymakers to strike a balance between the benefits and risks of AI. By taking a measured and responsible approach to AI development and deployment, we can ensure that these technologies can be used to benefit society as a whole and address potential concerns,



Fig. 10. Top-30 Most Salients Terms of "Artificial Intelligence". (a) Before the Release. (b) After the Release.

TABLE VI COMMENTS ON CHATGPT IN AI SCENARIO.

Attitude	Content
Negative	As an AI chatbot, ChatGPT has almost become synonymous with "knowing everything", but it can also spout nonsense. In reality, it simply re-edits known information, and its sources are unreliable. #Will ChatGPT really replace humans?#
Neutral	#ChatGPT# AI is very intelligent, but AI is still AI.
Positive	Working with ChatGPT is really convenient. For tasks like writing emails that are procedural in nature, of course, it makes sense to have AI do it!

rather than simply fueling fears of an AI takeover.

2) Scenario 2: Human-Computer Collaboration and Interaction: In today's digital world, human-computer collaboration has become increasingly crucial. With the rapid development of AI technology, machines like ChatGPT can now comprehend and process human language, providing valuable insights and assistance. This creates opportunities for humans and computers to collaborate in innovative ways, accomplishing complex tasks that were previously impossible. Therefore, integrating AI into human-computer collaboration has improved efficiency, productivity, and accuracy in various fields, including healthcare, finance, and education. ChatGPT serves as a prime example in this regard, as it is designed to assist users in generating human-like responses to various prompts, providing a seamless collaboration experience between humans and computers. In this section, we use the keywords "human-computer collaboration" and "humancomputer interaction" to search for relevant content on Weibo.



Fig. 11. Sentiment analysis of "Collaboration and Interaction". (a) Before the Release. (b) After the Release.

As shown in Figure 11, the difference in percentages between individuals who hold positive and negative opinions on these topics is not statistically significant both before and after the release of GPT-4, which is quite distinct from other scenarios. Although the majority of people remain neutral about these topics, this may imply that most individuals do believe that ChatGPT and comparable tools can, to some degree, enhance human-computer collaboration and interaction, rather than being as pessimistic as its application in the field of education, where originality is of utmost importance.

Given the limited number of posts related to these keywords (Table II), we have shifted our attention to examining specific examples of human-computer collaboration and interaction, such as Copilot Office [9], to explore the topic further. As a novel AI-powered service deeply integrated with ChatGPT and released alongside GPT-4, Copilot Office can assist us in 9

TABLE VII COMMENTS ON CHATGPT IN COLLABORATION AND INTERACTION SCENARIO.

Attitude	Content
Negative	Fortunately, at present, AI is unable to write code; otherwise,
Neutral	In the heated discussions around human-computer interaction, the focus of ChatGPT is not actually on the anxiety of whether it will replace humans or not but on how humans can undate
Positive	It will replace humans of hot, but on how numbers can applied their concepts and find the path to the future. I quickly recognized the positive changes and enhancements that these new AI products have brought to my work. Specifi- cally, new AI tools have saved me substantial time in creating documents, Copilot may even automate the generation of my PPTs in the future.

a broad range of Microsoft 365 app-related activities, such as writing, editing, summarizing, analyzing, and visualizing data, by accepting natural language commands, similar to ChatGPT. We conducted a targeted search on Weibo utilizing the keyword "Copilot Office" and retrieved several posts associated with it. The results are demonstrated in Figure 12.



Fig. 12. Sentiment analysis of "Copilot Office".

Overall, the sentiment towards Copilot Office was primarily neutral, with only a few users expressing positive or negative views, which is consistent with our findings. Note that the use of AI-powered tools in the workplace is still a relatively new concept, and Copilot Office is still in the beta testing phase so not everyone has access to it, leading to a lack of full understanding of the potential benefits and drawbacks of such technologies. As these tools become more widespread and familiar, it will be interesting to observe how public perceptions towards them will change and evolve over time.

Following the release of GPT-3, individuals exhibited a heightened optimism regarding its potential applications in the realm of human-machine interaction. Various terms such as "important", "significant", and "widespread" were frequently observed and were clustered together as a cohesive topic using LDAvis [29]. However, with the introduction of GPT-4 and the widespread adoption of AI tools deeply leveraging its capabilities, individuals have directly experienced the disruptive nature of human-machine interaction and collaboration. Consequently, there has been a significant surge in the frequency of the term "powerful", propelling it to the forefront of discussions. Undoubtedly, AI-powered tools are "powerful" and "efficient", owing to their ability to process vast amounts of data and provide users with specific insights in mere seconds, a feat that would be almost impossible for humans to achieve. While this kind of collaboration and



Fig. 13. Top-30 Most Salients Terms of "Collaboration and Interaction". (a) Before the Release. (b) After the Release, with "Copilot Office" merged.

interaction between humans and computers is revolutionary, a substantial number of individuals also expressed concerns regarding safety and other issues, such as job loss.

Indeed, safety is a crucial concern in the development of AI systems. The ChatGPT developers have recognized the importance of safety and are actively working towards creating reliable and secure systems that are free from bias, discrimination or toxic content. Despite these efforts, the complete harmlessness remains unwarranted. Therefore, it is imperative for developers to prioritize safety and implement adequate measures to mitigate risks, while also ensuring the full optimization of AI-powered tools. Given the continuous evolution of technology, it is essential to remain vigilant and proactive in addressing safety concerns, particularly in the realm of human-computer collaboration and interaction.

3) Scenario 3-Law, Morals and Ethics: In the aforementioned analysis, a notable prevalence of the keyword "safe" was observed. In order to delve deeper into this phenomenon, we performed supplementary data collection utilizing the keywords "Law" and "Morals and Ethics." This additional investigation sought to examine the influence of ChatGPT on legal and ethical dimensions and to ascertain the existence of any concurrent developments in terms of regulations or norms.

People have consistently expressed concerns about the ethical and legal impact of AI. As can be seen from Figure 14, attitudes towards such AI tools with regard to ethics and law



Fig. 14. Sentiment analysis of "Law, Morals and Ethics". (a) Before the Release. (b) After the Release.

remain remarkably consistent both before and after the launch of GPT-4, with a mere 1.3% and 1.2% having a comprehensive positive view, which is the lowest among all the scenarios. Some individuals fret over ChatGPT's potential to compromise privacy, generate malicious responses, portend unethical content, and even spur people toward criminal activities, thereby violating laws and eroding moral values. Nonetheless, some individuals contend that what humans should fear is becoming the Satan of the earth, not the world under AI. According to their perspective, ChatGPT could serve as a valuable tool, driving positive societal developments.

 TABLE VIII

 COMMENTS ON CHATGPT IN LAW, MORALS, AND ETHICS SCENARIOS.

Attitude	Content
Negative	I have cracked ChatGPT's restrictions on ethical answers, and I will not disclose how to crack it because if it is used by bad people, the world will be in danger.
Neutral	It is the general trend for AI to replace technical jobs, but in fields that challenge the basic survival of human beings, it is impossible to completely hand over to AI.
Positive	#ChatGPT#It is crucial to foster a gradual understanding and active participation in this transformation while con- scientiously considering the ethical, legal, and philosophical implications that emerge from the convergence of these new technologies.

According to our topic analysis, the top 3 mentioned keywords before the release is still "hot", "powerful" and "important", signifying people's recognition of the significance and impact of ChatGPT in the ethical dimension. Additionally, "different" and "precise" reflect people's understanding of the distinct effects that ChatGPT may generate in disparate domains, and the accuracy of ChatGPT is an essential consideration for ChatGPT's performance. However, following the release of GPT-4, the frequency of words expressing concerns, such as "weak", "steady", "caution" and "false" has increased in addition to common words like "important" and "powerful." In the LDA clustering results of GPT-4 data, words such as "safe", "steady" and "weaker" are grouped under



Fig. 15. Top-30 Most Salients Terms of "Law, Morals and Ethics". (a) Before the Release. (b) After the Release.

one topic, while "different", "false" and "health" are grouped under another, highlighting expectations and requirements regarding ChatGPT's legal and ethical development. There is a growing need for AI tools like GPT to develop in a more stable, controllable, and secure manner. The rapid progress and unpredictable output content of ChatGPT, coupled with the potential for errors, can pose significant challenges to existing national laws, regulations, and citizens' moral and ethical values, leading to potential chaos.

As shown in Table VIII, some people claim to have cracked the restrictions of ChatGPT on generating ethical answers, and worry that this method may be abused and lead to harm. In fact, OpenAI has been fine-tuning the model based on human feedback [35], and the probability of InstructGPT generating toxic content is considerably lower than that of GPT-3. It is worthwhile to further fine-tune ChatGPT to better conform to ethics and morality. Many people believe that humans need to take a dominant role in their relationship with AI and use it as a tool to benefit humanity.

4) Summary: The second part of this study delves into the impact of a powerful AI system, such as ChatGPT, on human beings. To conduct our analysis, we searched for relevant content on Weibo using keywords such as "artificial intelligence", "human-computer collaboration", "humancomputer interaction", "copilot office", "law", "morals and ethics". and performed sentiment and topic analysis. Despite a slight increase in the proportion of individuals expressing a positive attitude towards AI compared to the education sector, the majority still maintains a negative perception of AI.

Individuals raise valid concerns about the potential problems of widespread AI applications, including, but not limited to, privacy infringement, content bias, and inaccurate results. As AI systems become more integrated into our daily lives, people fear that their personal information may be misused or even exploited by malicious actors. Additionally, they worry that AI's learning algorithms may be susceptible to bias, which could lead to unequal treatment and discrimination against certain groups. Moreover, AI systems may not always produce accurate results, potentially leading to harmful consequences.

Therefore, while the implementation of appropriate regulations by the government is necessary, it is more critical that researchers develop specific technical methods to optimize AI programs at their source to mitigate these concerns.

V. DISCUSSION

Many new technologies, not just ChatGPT, can trigger widespread discussions and emotional fluctuations among netizens on social networks. Qaiser et al. [36] have found that the majority of the people whose tweets were collected and analyzed have negative sentiments regarding the impact of technology on employment and advancements in technologies like AI, Automation, and Robotics. Clarizia et al. [37] found that students showed natural disorientation when exposed to new technologies or concepts in e-learning courses, and there was an increasing trend of positive sentiment after teacher updated the teaching style based on student emotions and introduced more content. Hernández-Fernández et al. [38] analyzed consumer's unconscious and conscious reactions towards new technological products using a case study involving Google Glass, a wearable device of augmented reality. They found that when introducing a novel technology like Google Glass to potential consumers, participants primarily exhibited surprise in their facial expressions (38%), followed by sadness (17%), neutral expressions (13%), happiness (13%), fear (10%), anger (5%), and disgust (4%). The emotion of surprise is typically considered neutral, but when followed by another emotion, it can become either positive or negative by contagion [39]. The failure of new technological products such as Google Glass may be explained by a negativity bias, which occurs when the negative surprise component neutralizes and exceeds the positive surprise component, so it is crucial to guide user emotions in a positive direction during the process of releasing and applying new technologies.

The comparison between our study on Weibo and a related study by Tlili et al. [15] on Twitter reveals some similarities and differences in the trends observed. One of the similarities is that neutral or unclassified sentiment dominates the majority of the comments related to ChatGPT's application in education, reflecting the complex and nuanced nature of people's attitudes towards this technology. Another similarity is that both studies highlight some common advantages and concerns regarding ChatGPT's use in education, indicating consistency in people's perceptions across social media platforms.

However, there are also some notable differences between the two studies. Our research shows that negative sentiment represents a significantly higher proportion than positive sentiment, in contrast to the related study that reports a higher proportion of positive sentiment. One possible explanation for this difference could be the cultural and social differences between China and Western countries, where Twitter is more popular. For example, the Confucian emphasis on selfcriticism and self-doubt in Chinese culture may contribute to a more critical and skeptical attitude, while the Western culture tends to emphasize optimism and individualism, which may influence people's attitudes towards ChatGPT.

Unlike the application of ChatGPT in the education field, in other fields involving human-computer interaction and collaboration, such as the industrial sector, the opinions derived from using ChatGPT based on Twitter data [40] and those obtained from Weibo data are remarkably similar. Among most of the application scenarios listed by Aram Bahrini et al. [18], ChatGPT can be widely used to improve efficiency, but they also repeatedly emphasized the need to pay attention to ethical, privacy, and security issues during the use process, as well as erroneous outputs, and the importance of fostering inclusiveness. This aligns with our conclusions in the second part of our analysis. While AI-powered tools such as ChatGPT have undoubtedly brought many benefits, such as increased efficiency and productivity in the workplace as well as the potential to save time and money, it is crucial to be mindful of the potential risks associated with these technologies.

When it comes to biases, there is a concept that is gaining increasing attention: Inclusive AI [23], [24], [25]. Our world is characterized by diversity, encompassing a multitude of cultures and people with varied backgrounds. Nevertheless, human-created AI often falls short of accurately representing this rich diversity due to a range of limitations. Thus, it is crucial to explore strategies that promote fairness, inclusivity, and user-friendliness in human-created AI. For instance, the study conducted by Druga et al. [41] revealed that children's opinions and their actual chances of engaging with AI are susceptible to various influencing factors, including nationality, age, and social-economical status (SES), and consequently, the researchers advocate for the inclusion of professional expertise in supplementing such content. Ovalle et al. [42] found that individuals identifying as transgender and non-binary (TGNB) experience significantly elevated rates of discrimination and exclusion in their daily lives. Their study centered on the evaluation of (1) misgendering and (2) harmful responses to gender disclosure within the context of open language generation, which revealed a prevailing influence of binary gender norms, emphasizing the urgent requirement for increased focus on inclusive AI, including LLMs or any other models.

Looking forward, it is likely that the public discourse on

ChatGPT's application in education will continue to evolve and change over time, reflecting the ongoing development and implementation of this technology. As more people become aware of ChatGPT's capabilities and limitations, there may be a shift in the dominant sentiment towards this technology, with more nuanced and differentiated perspectives emerging. Additionally, the emergence of new social media platforms and the evolution of existing ones may also influence the nature and scope of public discourse on ChatGPT and its applications, which underscores the importance of continued monitoring and analysis of social media data.

Over time, as AI technologies such as ChatGPT continue to advance, a growing number of issues and concerns will inevitably arise, as evidenced within the scope of this article. Consequently, to enhance the effectiveness of these technologies in serving individuals, education, and various societal domains, and to address concerns before they manifest as problems, as well as to facilitate understanding and acceptance of these technologies, it is imperative to implement effective measures. Building upon the analysis presented in this article, we put forward the following recommendations:

- 1) Improving datasets. As an LLM, the quality of datasets is of utmost importance. With the ongoing advancement of LLMs, it is imperative to continuously enhance and expand datasets to encompass a wider array of topics and contexts. Simultaneously, we must strive to mitigate or eliminate the use of datasets that contain biases or harmful information. Through these measures, we can enhance the model's comprehension and capacity to address diverse inquiries, bolster response accuracy, and mitigate the potential harm of generated content, thereby augmenting its utility in education and other fields.
- 2) Enhancing explainability and transparency. Achieving explainability in AI models, such as GPT, is a critical concern [43]. These models comprise intricate structures and numerous parameters, rendering their internal decision-making processes challenging to interpret and comprehend. The lack of explainability impedes users and developers from gaining a precise understanding of how AI dialogue models generate responses, discerning the rationale behind their decisions, and evaluating their accuracy and fairness. To alleviate concerns regarding AI technology, developers should prioritize enhancing the transparency and explainability of models. This can help people understand how the model arrives at its answers, increasing trust and acceptance.
- 3) Promoting ethical guidelines and legal regulations. On one hand, it is essential to establish industry standards and ethical guidelines to govern the development and application of AI technology. These guidelines should encompass various aspects such as handling sensitive topics and information, adhering to principles of robot ethics, and ensuring fairness, thereby ensuring that the application of AI technology is equitable, ethical, and dependable. On the other hand, governments should enact legal frameworks that are adaptable to the advancements in AI technology, ensuring its lawful, secure, and

dependable utilization. This encompasses implementing pertinent laws to safeguard data privacy, transparency requirements, accountability mechanisms, regulations concerning data usage and sharing, adherence to security standards, and other related measures.

4) Promotion and collaboration. According to our data, a substantial number of individuals maintain neutral towards AI technologies, particularly when considering practical applications like Copilot Office. We attribute this phenomenon to a lack of adequate understanding among the general population concerning these specific applications. Therefore, it is imperative to conduct extensive promotional activities to ensure a comprehensive grasp of the advantages and disadvantages of such technologies. For instance, organizing targeted training sessions and informational conferences can be highly effective. These initiatives can elucidate the benefits of AI technology, while also shedding light on its limitations and potential risks. Furthermore, offering appropriate demonstrations and presenting case studies that showcase the practical applications of AI in various domains, including education and other facets of daily life, can contribute to a deeper understanding of its value. In summary, AI development requires various stakeholders' participation and collaboration. Governments, academia, industry organizations, and the general public should all be involved in the development and application of AI. Establishing cross-disciplinary collaboration platforms, promoting open dialogue, and sharing best practices are essential to ensure the sustainable development of AI technology and meet the needs and expectations of all stakeholders.

VI. CONCLUSION

This study conducted a social survey to investigate views on the application of ChatGPT in education and other fields, such as human-computer collaboration. The research reveals that most people maintain a neutral or negative attitude towards those applications due to concerns such as personal privacy infringement, content bias, and the ruin of originality, particularly in education. However, with the release of GPT-4, more people are recognizing its potential, resulting in a higher proportion of positive attitudes. Nevertheless, the majority still maintains a negative perception of AI, with concerns raised regarding its potential problems. Thus, this study emphasizes the importance of considering public perception and concerns when developing and implementing AI technologies like Chat-GPT in various fields. It is crucial to alleviate worries to ensure the successful adoption of ChatGPT while minimizing potential risks.

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