

RETRACTED ARTICLE: A Cogitation on the ChatGPT Craze from the Perspective of Psychological Algorithm Aversion and Appreciation

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Abstract: In recent times, ChatGPT has garnered significant interest from the public, sparking a range of reactions that encompass both aversion and appreciation. This paper delves into the paradoxical attitudes of individuals towards ChatGPT, highlighting the simultaneous existence of algorithmic aversion and appreciation. A comprehensive analysis is conducted from the vantage points of psychology and algorithmic decision-making, exploring the underlying causes of these conflicting attitudes from three dimensions: self-performance, task types, and individual factors. Subsequently, strategies to reconcile these opposing psychological stances are proposed, delineated into two categories: flexible coping and inflexible coping. In light of the ongoing advancements in artificial intelligence, this paper posits recommendations for the attitudes and actions that individuals ought to adopt in the face of artificial intelligence. Regardless of whether one exhibits algorithm aversion or appreciation, the paper underscores that coexisting with algorithms is an inescapable reality in the age of artificial intelligence, necessitating the preservation of human advantages.

Keywords: ChatGPT, contradictory psychology, algorithm aversion, algorithm appreciation, algorithmic decision-making, artificial intelligence

Introduction

On November 30, 2022, OpenAI, an American company, released a chatbot called ChatGPT, which quickly caught the attention of people worldwide. Subsequently, OpenAI iterated with a new model version called GPT-4, but opinions about it were mixed.¹ Some praised the convenience it brought,^{2,3} while others expressed concerns about its potential impact on the existing social order. These discussions even sparked a larger debate on how AI would influence the development of human society. This article starts from the contradictory attitudes of individuals towards AI products like ChatGPT and explores the underlying psychological mechanisms behind the contradictory attitudes of algorithm aversion and algorithm appreciation. Drawing on relevant theories and literature on algorithmic decision-making, it proposes approaches for future AI development to address these contradictory attitudes.

ChatGPT, Algorithmic Contradictory Attitudes, and Algorithmic Decision-Making

ChatGPT is not a completely new entity but rather a new development in the field of artificial intelligence, representing a product of the new era of AI. ChatGPT, which stands for Chat Generative Pre-train Transformer, is a language model based on natural language processing and deep learning techniques.⁴ It possesses the ability to process and analyze information and generate responses, going beyond the generation of human-like natural language. Additionally, ChatGPT can be combined with other technologies such as speech, image, and video to generate diverse answers.⁵ In practical applications, it enables real-time human-machine interaction, helping individuals clarify their thoughts and feelings, understand their context and situation, and continuously optimize the decision-making process based on individual

feedback on the answers. The emergence and development of ChatGPT signify significant progress in the field of human-machine interaction through natural language processing and deep learning technologies. The appearance of ChatGPT means that artificial intelligence can generate natural language like humans, enhancing machine understanding and processing of the complexity of human language. As ChatGPT and its competitors continue to emerge, individuals are increasingly concerned about the impact and potential risks of these technologies.

The core of ChatGPT is its algorithm. Individuals' attitudes toward algorithms, especially new algorithms, always exhibit contradictory aspects: algorithm aversion, algorithm appreciation, and even a coexistence of aversion and appreciation. As early as the 1950s, Meehl (1954) pointed out that despite the availability of superior statistical models, doctors still tend to rely on their intuition when making medical decisions.⁶ Since the beginning of the 21st century, advanced technologies such as AI have entered the integration and application stage, and the performance of supporting algorithms has continued to improve.⁷ However, similar phenomena still exist. Dietvorst et al further noted that even when users see algorithmic predictions outperforming human predictors, they still tend to resist using algorithms.⁸ They defined this phenomenon as algorithm aversion. Although Dietvorst et al also emphasized that algorithm aversion occurs when algorithms make errors or fall short, research has found that individuals may still resist using algorithms even when they have not observed any algorithmic errors.⁹ Therefore, algorithm aversion refers to individuals exhibiting negative attitudes and behaviors toward algorithms. In contrast to algorithm aversion, algorithm appreciation refers to individuals exhibiting positive attitudes and behaviors toward algorithms, indicating a high reliance on algorithms.¹⁰ For example, individuals frequently using internet search engines can be seen as appreciating search algorithms.¹¹ Regarding ChatGPT's absolute advantage among current generative language models, people's attitudes are not simply aversion or appreciation but rather a complex contradictory psychology. We define this contradictory psychology as simultaneously having positive and negative orientations toward an object. "Orientation" refers to the alignment or position of the actor relative to the object, where a positive orientation implies attraction or drawing toward it, and a negative orientation implies rejection or pushing away from it. Numerous studies indicate that people's attitudes toward ChatGPT are inclined toward this contradictory psychology.

Algorithm aversion and algorithm appreciation represent individuals' attitudes toward artificial intelligence algorithms. They arise from algorithmic decision-making, which typically refers to the process of human decision-making aided by algorithms. The term "algorithm" here can range from a simple calculator to complex AI autonomous decision-making systems based on big data, machine learning, and deep learning algorithms.¹² Examples of such systems include automated decision-making, enhanced decision-making, computer decision support systems, computer recommendation systems, decision aids, expert systems, and diagnostic aids.¹³ With the continuous evolution of AI algorithms, they have been widely applied in various fields. In healthcare, medical decision support systems can assist healthcare professionals and patients by providing medical, health, and management advice.¹⁴ In finance, algorithms can provide investment and financial risk management advice to businesses or investors.¹⁵ In the consumer domain, algorithms based on big data can offer personalized shopping recommendations and influence user consumption decisions from the perspective of consumer psychology.¹⁶ In daily life, algorithms can propose personalized dietary and healthy lifestyle recommendations based on individual data. ChatGPT, with algorithms at its core, has even broader applications and can provide assistance across multiple industries, potentially driving industry development.¹⁷ Algorithms undoubtedly bring convenience, but they also come with risks such as data bias, algorithmic bias, ethical and moral considerations, and technological dependency.¹⁸ As algorithms penetrate deeper into human life, individuals, faced with the effectiveness and limitations of algorithms, gradually form different attitudes toward them. Especially when faced with a new phenomenon like ChatGPT, it is necessary to further elucidate the reasons behind individuals' contradictory attitudes toward it.

Psychological Mechanisms of Algorithm Aversion and Appreciation and the Contradictory Attitudes Toward ChatGPT

Although there is no definitive conclusion regarding the specific causes of algorithm aversion, appreciation, and the contradictory attitudes, existing research suggests that algorithm aversion is influenced by factors such as algorithm performance, task type, and individual differences.¹⁹ Similarly, algorithm appreciation is influenced by factors such as

algorithm performance, algorithm usage experience, environmental influences, algorithm objectivity and transparency, and a certain degree of anthropomorphism.²⁰ Overall, algorithm aversion and appreciation lie on a continuum and are constrained by factors related to algorithm performance, task type, and individual differences, resulting in contradictory attitudes towards algorithms in certain situations. Based on this, this paper explores the individual's algorithm aversion and appreciation towards ChatGPT, considering its performance, task requirements, and individual characteristics, in order to further reveal the reasons behind the emergence of contradictory attitudes.

ChatGPT's Performance

The rapid growth of registered user data since its release indicates that ChatGPT was initially appreciated by people, which may be related to its performance. Venkatesh et al proposed the Unified Theory of Acceptance and Use of Technology to explain individual acceptance and use of technology and its influencing factors.²¹ This theory suggests that performance expectancy (ie, "the degree to which an individual believes that using AI helps to improve job performance") significantly influences individual acceptance and use of technology. In the case of AI systems like ChatGPT, individuals have higher performance expectations and tend to assign relatively difficult tasks to them for resolution. As previously mentioned, ChatGPT possesses powerful capabilities due to advanced algorithms, strong computational power, and massive amounts of data. The algorithm used by ChatGPT is based on a transformer architecture, which incorporates self-attention mechanisms to form dynamic and optimizable algorithms. With computational power and data, ChatGPT can perform parallel computations, save time for algorithm learning and training, and gradually optimize the decision-making process. From the perspective of the generation and development of ChatGPT, its introduction and advancement signify significant progress in natural language processing and deep learning technologies in the field of human-computer interaction. The emergence of ChatGPT means that artificial intelligence can generate natural language like humans, which advances the machine's ability to better understand and process the complexity of human language. As more and more ChatGPT and similar products emerge, individuals are increasingly concerned about the impact and potential risks posed by these technologies.²²

However, along with the increase in the number of registered ChatGPT users, there have also been negative opinions and criticisms, mainly focused on concerns about whether artificial intelligence will replace humans and the academic, ethical, and data security issues associated with ChatGPT. There are several reasons for this: Firstly, based on ChatGPT's performance, it is a large-scale language model and thus has inherent limitations, including its lack of reliability. Although ChatGPT can provide seemingly good responses in many cases, there is a possibility that it may provide inaccurate answers. Users generally expect AI to be more perfect and have less tolerance for errors.²³ When they discover the lower accuracy of ChatGPT's responses to simple questions, it may lead to algorithm aversion. Secondly, the knowledge learned by ChatGPT has a certain timeliness. ChatGPT cannot update its knowledge system in real-time and its knowledge system is based on a database from before September 2021, lacking information from subsequent periods. This limitation may also contribute to algorithm aversion. Thirdly, the high training cost is another limitation of ChatGPT as a large-scale language model. Several years ago, the AlphaGo versus Lee Sedol Go match raised doubts about whether artificial intelligence would replace humans, but people often overlooked the high energy consumption of AlphaGo. Fourth, as mentioned earlier, ChatGPT's large-scale language model is pre-trained based on real-world language data, and due to data biases, it may generate harmful content. Lastly, it is important to note that ChatGPT is deployed by OpenAI, and user data is controlled by the company, which may pose data leakage risks with long-term large-scale usage. The data security issues brought by ChatGPT can also lead people to discontinue its use. Research has shown that after experiencing unfavorable results, individuals significantly decrease their utilization of automation.²⁴ Therefore, if ChatGPT makes mistakes during the user experience process, regardless of the severity of the errors, it will evoke negative emotions, and the negative experience caused by these emotions will reduce users' inclination to continue using ChatGPT, leading to algorithm aversion.²⁵

Additionally, anthropomorphism is an important characteristic of algorithm performance. Anthropomorphism is the process of attributing human characteristics, motivations, intentions, or mental states to non-human objects, and it significantly influences an individual's aversion or appreciation of artificial intelligence.²⁶ Unlike the concept of humanization, which can include humans themselves, anthropomorphism is limited to non-human objects and is

a more specific concept.²⁷ Machines and algorithms are common objects of anthropomorphism, and it significantly increases the utilization and appreciation of artificial intelligence. For example, previous studies have shown that perceived anthropomorphism can enhance the willingness to engage in conversations with chatbots like ChatGPT, possibly because anthropomorphism makes individuals perceive the social presence of the chatbot.²⁸ As a product developed based on human feedback reinforcement learning technology, ChatGPT already possesses a certain potential for anthropomorphism.²⁹ Although it does not present itself in the form of a visual face to users, its high-level interactive information can compensate for this limitation to some extent. Research suggests that the more individuals perceive the thoughts behind the chatbot, the closer their relationship with the chatbot becomes, especially when the chatbot uses social cues, resulting in a stronger intimate connection between individuals and the chatbot.³⁰ Studies in neuroscience have also found that individuals' perception of anthropomorphism in chatbots depends not only on the perception of the external appearance, cognitive intelligence, and emotional intelligence of the subject but can also result in intelligent agents without a physical presence.³¹ This perception of anthropomorphism and subsequent behavioral tendencies are closely related to the activity intensity of the brain's dorsomedial prefrontal cortex and superior temporal gyri, which are involved in the perception of anthropomorphism.³² These findings indicate that the linking perception and social cues in language-based chatbots such as ChatGPT are crucial for creating a positive chatbot experience. It is worth noting that research has found that as the degree of artificial intelligence anthropomorphism increases, the moral responsibility attributed to it also increases, and this effect is achieved through the enhancement of artificial intelligence's perceived free will caused by anthropomorphism.³³ Therefore, although a higher level of anthropomorphism can lead to algorithm appreciation, excessive anthropomorphism can also result in algorithm aversion and even generate the "uncanny valley effect" (the feeling of unease when AI becomes too intelligent, leading to a decrease in preference).³⁴

Task Types and the Use of ChatGPT

The subjective and objective nature of tasks can influence individuals' algorithm aversion and appreciation. Individuals tend to adopt algorithm assistance for objective tasks. For example, when estimating numerical values of visual stimuli, users are more inclined to use algorithms. However, in subjective tasks, individuals tend to rely less on algorithms because algorithms are generally considered to lack intuition and subjective judgment.

This finding has been replicated by Castelo et al and Borjesson and Rahwan, who argue that intelligent algorithms lack the abilities required for subjective tasks, and when subjective judgment is more important, individuals rely less on algorithms.¹⁸ However, some studies suggest that even in subjective task types, algorithm appreciation may still be present. ChatGPT has a wide range of applications and can perform both objective tasks, such as language translation, Python code interpretation, and bug fixing, and subjective tasks, such as generating reviews, conducting interviews, answering questions, and analyzing sentiment scores. This makes it easier for individuals to develop contradictory attitudes towards ChatGPT.

When it comes to tasks involving ethical considerations, individuals tend to trust their own judgment rather than algorithms. ChatGPT itself is programmed to avoid answering ethical questions, but in some exceptional cases, it may produce comments related to ethics. This may lead to algorithm aversion in individuals. Previous research has found that the misuse of AI systems like ChatGPT for ethical decision-making can exacerbate inequality between individuals and may even lead to more serious real-world threats.³⁵ ChatGPT has raised widespread academic discussions about ethical issues. Based on its advantages, some educational institutions have begun encouraging students to use ChatGPT, such as the Hong Kong University of Science and Technology.³⁶ However, top journals such as *Science* and *Nature* have emphasized that AI programs should not be considered authors. The mechanisms behind the influence of task types on algorithm aversion and appreciation are still unclear, but it is speculated that task difficulty plays a role. Previous research has found that low-difficulty tasks result in lower cognitive load, leading to cognitive resource waste and aversion, while high-difficulty tasks can generate higher cognitive loads, making individuals more likely to appreciate algorithms.³⁷ Similarly, using ChatGPT to solve high-difficulty tasks may be one of the reasons why it has gained popularity in a short period. Moreover, objective tasks generally have higher difficulty levels, while subjective tasks have lower difficulty levels, which is partially supported by relevant studies, but further research is needed to validate these claims.³⁸

Individual Factors Influencing Algorithm Aversion and Appreciation of ChatGPT

Currently, although there is no specific research exploring the individual factors influencing algorithm aversion and appreciation of ChatGPT, based on previous studies on individual factors influencing algorithm aversion and appreciation, they can be roughly divided into two aspects: personality factors and demographic factors. In terms of personality factors, self-esteem, self-efficacy, locus of control, and neuroticism, which are core self-evaluations of individuals, are related to algorithm aversion. Evaluations of the external world are not only influenced by the characteristics of objects and individuals' attitudes towards these objects but also by individuals' attitudes towards themselves, others, and the world. The aversion and appreciation of ChatGPT are also influenced by individual factors. From a demographic perspective, the acceptance of algorithms varies depending on individuals' age, gender, and education level. In terms of the current popularity, ChatGPT is more popular among young people, and its popularity in the academic community indicates that it is favored by individuals with higher levels of knowledge.

In conclusion, the aversion/appreciation of ChatGPT is influenced by various factors, and the interaction of these factors leads to contradictory attitudes among people. Different usage patterns can emerge, such as people criticizing it but still using it or actively discussing it but not using it. It is necessary to overcome the contradictory attitudes towards ChatGPT and develop a more balanced attitude towards it. To achieve this, strategies to overcome the contradictory attitudes towards ChatGPT are proposed.

Strategies to Overcome the Psychological Contradictions of ChatGPT

In his book "21 Lessons for the 21st Century", Yuval Noah Harari raises the question of which is more valuable: intelligence or consciousness?³⁹ As unconscious intelligence rapidly advances, humans must actively upgrade their "minds" if they do not want to be collectively eliminated. The attitude towards algorithms is crucial for upgrading the so-called "mind", which is particularly important in the era of new artificial intelligence represented by ChatGPT. Overcoming the psychological contradictions surrounding ChatGPT and algorithms, in general, is of great significance. Strategies can be adopted from two perspectives: inflexible coping strategies and flexible coping strategies, with the latter aiming to address the root causes of psychological contradictions. This paper proposes some suggestions for the development of artificial intelligence in China, focusing on overcoming algorithm aversion and blind appreciation of ChatGPT.

Regarding strategies to overcome algorithm aversion, one approach is to employ a "human-in-the-loop" strategy during the design phase, where human operators have the opportunity for second or continuous instruction correction after the initial input. Research by Dietvorst et al⁴⁰ found that allowing individuals to adjust imperfect algorithms significantly increases the likelihood of their use and belief in the algorithms. Allowing individuals to adjust the predictive values of algorithms moderately can also lead to better performance. For users to take action based on the algorithm's judgments, they must feel a strong sense of control and have enough confidence to trust the algorithm. Therefore, the human-in-the-loop strategy can stimulate users' sense of decision-making autonomy and enhance their inclination to use algorithms for decision support. In the future, AI systems like ChatGPT can open up the permission for users to modify the results, creating a win-win situation in human-machine interaction.⁴¹ However, this approach also brings challenges, such as the social adaptability of algorithms brought by human diversity.

Another strategy to alleviate algorithm aversion is to increase the level of anthropomorphism. For chatbots like ChatGPT, enhancing their social presence is crucial because individuals unconsciously apply social rules to their interactions with artificial intelligence. Increasing the level of anthropomorphism can evoke users' social cognitive responses. More human-like language and cuteness can influence individuals' aversion/appreciation of algorithms. In the future, it is necessary for ChatGPT to present more human-like facial features or further improve its learning ability and level of understanding social rules. Lastly, improving algorithm awareness can also help alleviate algorithm aversion. Algorithm awareness refers to whether individuals are aware of the influence of algorithms in their daily lives, and it is usually closely related to experiences, privacy concerns, normative values, and literacy surrounding algorithms. Enhancing users' understanding of algorithms and increasing algorithm transparency can be the main means to improve algorithm awareness and enhance users' perceived performance of algorithms. In the future, various flexible approaches

can be adopted to cultivate algorithm awareness among the general public and improve the application of algorithms. The birth of ChatGPT has brought great convenience, but it has also led some individuals to blindly appreciate algorithms and excessively rely on them. Therefore, it is necessary to overcome blind appreciation of algorithms, recognize the problems associated with algorithms, especially with rapidly evolving machine models like ChatGPT, and address academic ethics and data security issues that arise with their widespread use.

With the emergence of ChatGPT, people have seen the dawn of achieving general artificial intelligence, but it has also created panic. On one hand, people hope for the development of artificial intelligence, and on the other hand, they fear being replaced by artificial intelligence, especially in the field of education. In the face of this trend, it is important to consider how to deal with it and what measures to take in the future. Firstly, the development of artificial intelligence is a reflection of technological progress for human society. The emergence of ChatGPT has stimulated the development of artificial intelligence, particularly in the field of natural language models, both domestically and internationally. Within a few months, GPT-4 has been introduced, which is more intelligent and has capabilities comparable to human levels in many aspects. Clearly, artificial intelligence products, including ChatGPT, can serve as a benchmark in their respective industries, providing certain advantages and resources. Currently, not only OpenAI, but companies like Google, Anthropic, Baidu, and others have launched or are developing conversational general artificial intelligence systems similar to ChatGPT, aiming to keep up with or even surpass the world's technological forefront. Secondly, as technological progress unfolds, humans also need to have a deeper understanding of themselves in order to make better use of and leverage their own advantages. To this end, various large-scale brain projects have been launched worldwide, with three common research focuses: brain mapping, developing new technologies, and brain-related disorders. China initiated "The China Brain Project (CBP)" in September 2021 after years of preparation, also known as "Brain Science and Brain-Like Intelligence Technology". Its main purpose is to explore the neural mechanisms of cognitive functions, promote the development of brain-like intelligence technology, and diagnose and treat brain-related disorders. The framework is referred to as "one body, two wings". Currently, 20 Phase I projects have been launched, with a budget of approximately 3.2 billion yuan, covering five research directions: analysis of cognitive function principles, cognitive disorders, brain development in children and adolescents, brain-inspired computing and brain-machine intelligence, and technology platform construction. The China Brain Project has further expanded the three research focuses. Lastly, humans also need to make good use of artificial intelligence. The impact of artificial intelligence on the education industry is evident. Since the public release of ChatGPT, phenomena such as using it for "writing assignments" and "writing essays" have frequently been reported. The New York City Department of Education has announced restrictions on the use of ChatGPT on the network of New York City public schools. This academic ethics issue has sparked extensive discussions in academia and raised concerns. ChatGPT's powerful knowledge system surpasses many teachers, raising questions about the need for teachers in the future. Currently, it is undeniable that although ChatGPT has many functions, its innovation capacity still needs improvement, and innovation happens to be a human advantage. In the future, teachers can spend more energy cultivating students' innovative thinking abilities rather than focusing solely on improving their test-taking abilities. Students should also combine the convenience provided by artificial intelligence with the creativity and innovation of teachers, which will open up more possibilities for future development. In addition to paying attention to the impact of ChatGPT on the education sector, we should also pay attention to preventing the occurrence of "technology addiction". Similar to the widespread occurrence of internet addiction and gaming addiction accompanying the rise of social networks and online games, the broad use of ChatGPT without clear usage guidelines may give rise to a new type of addiction: "GPT addiction". Therefore, apart from attempting to catch up with and surpass the cutting-edge artificial intelligence technology, it is essential for domestic and international communities and various industries to quickly establish reasonable usage guidelines and specify usage areas to prevent the occurrence of "technology" addiction.

Conclusion

In summary, artificial intelligence algorithms have permeated all aspects of the world, and coexisting with algorithms is a reality that individuals must accept in the AI era, while also having the confidence not to be replaced by artificial intelligence (for example, some medical researchers believe that ChatGPT cannot replace the professional knowledge and

ability of surgeons to handle surgical complications)⁴² Many studies have exaggerated the role of ChatGPT, reasons include: the hype of new technology, the commercial interests of companies, misunderstandings about AI capabilities, and a strong desire for automation. To use ChatGPT responsibly, we need to have a realistic understanding of its capabilities and limitations. However, whether it is ChatGPT or more useful artificial intelligence tools developed in the future, they are all intended to contribute to the development and heritage of human technological civilization. When algorithms are beneficial to our lives, people need to adapt to the development of the times and technology and overcome their aversion to algorithms; on the other hand, when algorithms pose a threat to individual life and social development, we should evaluate the use of algorithms more cautiously rather than blindly overcoming our aversion to them. Therefore, maintaining a normal attitude towards algorithms is a compulsory course for contemporary people.

Data Sharing Statement

There is no data available for this study.

Ethics Approval

This article does not contain any studies involving animals and human participants performed by the author.

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