Membrane Technology
ISSN (online): 1873-4049

Reshaping Cognition and Emotion: An Ethical Analysis of AI Anthropomorphization's Impact on Human Psychology and Manipulation Risks

Yanmin Xu[1,#], Cong Zhao[2,#], Wanghua Cao[1,*]

[1]*School of Marxsim, Guangdong Ocean University, Zhanjiang 524088, Guangdong, China*
[2]*School of Marxsim, Zhejiang A&F University, Hangzhou 311300, Zhejiang, China*
[#] *Yanmin Xu and Cong Zhao contributed equally to this work.*
**Corresponding Author.*

Abstract:
With the rapid advancement of AI technology, the anthropomorphization of AI systems has reached unprecedented levels, enabling these systems to simulate human behaviors, emotions, and decision-making processes with remarkable accuracy. While this enhances human-computer interactions, it also raises significant psychological concerns. Research indicates that anthropomorphized AI can profoundly influence human cognition, emotions, and behavior, emphasizing the necessity to explore how these systems reshape human psychology and the potential risks of manipulation. This study investigates the psychological and social impacts of AI anthropomorphization, focusing on its effects on cognitive biases, emotional dependency, and decision-making. Utilizing a social cognitive theory framework, it examines how anthropomorphized AI evokes empathetic responses and fosters trust in AI systems. Additionally, the study addresses critical concerns related to the collection of emotional data, the potential for information manipulation, and the influence of AI on human decision-making processes. The findings reveal that anthropomorphized AI, through human-like emotional expressions and behaviors, significantly alters cognitive and emotional states. This alteration is characterized by heightened emotional resonance and dependency, making individuals more prone to unconscious guidance by AI during decision-making, thereby diminishing their autonomous decision-making abilities. Furthermore, the study highlights the increased risks of information manipulation and privacy invasion associated with AI anthropomorphization, complicating the ethical landscape of AI integration. In the realm of social behavior, anthropomorphized AI has the potential to change human social norms and interactions, possibly leading to a decline in social skills and the emergence of behavioral biases. To mitigate these risks, the study suggests enhancing the transparency and explainability of AI systems, improving public AI literacy, reinforcing ethical oversight and regulation, and promoting collaborative human-AI interaction models. These strategies aim to prevent AI from exerting undue influence over human psychology while ensuring a balanced relationship between technological advancement and human welfare. The research underscores the importance of ethical guidelines to harness the benefits of anthropomorphic AI for mental well-being while minimizing potential negative impacts, thus fostering responsible and beneficial AI integration in society.

Keywords: AI anthropomorphization, psychological reshaping, emotional resonance, social trust, decision-making behavior.

INTRODUCTION

With the rapid development of artificial intelligence technology, the trend of AI anthropomorphism is becoming more obvious: AI not only imitates human behaviour and language, but also imitates emotions and ways of thinking. This makes AI more natural and realistic when communicating with humans, increasing the sense of trust and intimacy between humans and AI. However, this trend also raises an important question: will AI anthropomorphism have an impact on the human psyche, reshaping and manipulating our cognition and emotions? In order to safeguard human subjectivity and rights, we need to explore the technical principles of mind simulation in depth, maintain the autonomy and health of the human psyche, and promote the orderly development of society through interdisciplinary cooperation, policy formulation, and ethical regulation.

LITERATURE REVIEW

The study of artificial intelligence anthropomorphism (AI anthropomorphism) and its impact on human psychological structure covers a wide range of fields such as social psychology, human-computer interaction, cognitive science, etc. AI anthropomorphism is a technique to endow AI with human characteristics and behaviours with the aim of making the AI more humane, user-friendly, and easy to interact with.AI anthropomorphism has been used in the field of human creativity for human work play a positive role [1], such as applied to psychological counselling programs to assist in the treatment of human mental health [2]. The influencing factors in the interaction process between human and AI systems are diverse and multi-layered.[3] Human-machine integration has become an inevitable trend, embedding AI anthropomorphic technology in the integration of social applications to further promote the development and progress of human society.[4] The literature is sorted out in combination with related research topics:

Development of AI Anthropomorphisation

The concept of anthropomorphism originated in psychology and refers to the tendency of human beings to ascribe human qualities to non-human objects (e.g., animals, machines, natural phenomena, etc.) Reeves and Nass [5], in The Media Equation, suggest that human beings tend to perceive the media and technological devices as social roles and unconsciously apply the rules of interpersonal communication when interacting with them. Their research laid the foundation for the application of anthropomorphism to human-computer interaction. Nass and Moon [6] further extended the theory of anthropomorphism by proposing "social responses theory". Through their experimental research, they found that when humans interact with computers, they exhibit social behaviours similar to those found in interpersonal interactions, such as politeness and trust.[7] These findings suggest that the phenomenon of anthropomorphism is not only a cognitive illusion, but also has far-reaching psychosocial implications. Breazeal's research [8] is a pioneering work in the field of social robotics, where she introduced the concept of Affective Computing, which emphasises the importance of emotional interactions between machines and humans, and that emotional expression and perception are crucial for the acceptance of social robots in human society. In the 2010s, some AI systems with a very high level of anthropomorphism, such as Apple's Siri and Google's Assistant, began to enter the lives of the general public.[9] These systems are not only able to understand human language, but also reason based on context and provide personalised services. With the development of technology, scholars have begun to focus on the far-reaching effects of anthropomorphism on human psychological structures. Turkle [10] explored the changing relationship between humans and technology, noting that humans' increasing reliance on technology for emotional communication has led to an alienation from real human relationships. This phenomenon reveals the potential risks of anthropomorphic technologies in altering the way humans behave psychologically and socially. In recent years, a growing body of empirical research has begun to explore the specific effects of anthropomorphism on the human psyche.[11] Banks [12] experimentally verifies whether social robots have Theory of Mind capabilities and discusses their impact on human trust and dependence. Furthermore, Złotowski et al.[13] and Seibt & Vestergaard [14] investigated the representation of anthropomorphism in different cultural and social contexts and the acceptance of anthropomorphic technologies in public settings, respectively.

Technical Core Principles of Mental Simulation

Mind simulation, as an important branch of artificial intelligence, has received considerable attention and research in recent years. In particular, anthropomorphic AI techniques that enable machines to better interact with humans by simulating the way they think and behave. The development of mind simulation can be traced back to the 1960s, when the disembodied theory of mind was shaped in a representational-computational way, and later, after the development of Hilary Putnam, Jerry Fodor, David Marr, etc., the Computational Theory of Mind (CTM) was formally proposed and became the first generation of Computational Theory of Mind, which gradually became mainstream in the field of Artificial Intelligence and Cognitive Science. The Computational Theory of Mind (CTM) claims that the mind is a computational system realised by the neural activity of the brain, in which cognition and consciousness are represented as computational forms. Since Jerry Fodor's 1975 language of thought hypothesis, computational theories of mind have evolved to incorporate a variety of paradigms, including symbolism and connectionism. Since the 1980s, a second generation of theories of mind has emerged with Embodiment as a central concept in the critique of strong artificial intelligence by Dreyfu [15,16], and Searle et al. [17] Shaun Gallagher summarises this theoretical framework as the "4Es of cognition", namely Embodied Cognition, Embodied Cognition, Embedded Cognition, and Embodied Cognition. Shaun Gallagher summarised this theoretical framework as "4E Cognition", i.e. Embodied Cognition, Embedded Cognition, Extended Cognition and Enactive Cognition, which revealed the core ideas of Embodied Theory of Mind. Embodied Cognition Theory advocates that the body and mind are interdependent, and human cognition cannot be separated from the interaction between the brain, body and environment. In recent years, deep learning techniques have made remarkable progress inspired by biological neural mechanisms and have fuelled the development of hybrid pathways that fuse symbolism and connectionism.[18] These new breakthroughs provide new directions for realising intelligent systems inspired by brain and mind.

THE RESHAPING OF THE HUMAN PSYCHE BY AI ANTHROPOMORPHISATION

AI anthropomorphism affects the human psyche through multiple pathways [19], mainly including emotional-emotional experiences, social trust reshaping, and behavioural decision-making influences.

Reframing the Emotional Affective Experience

The trend of AI anthropomorphisation has triggered new thinking about the impact on the human psyche. In terms of emotional remodelling, by simulating human emotional responses, AI can not only influence human emotional states, but also potentially reshape our emotional experiences. First, AI's anthropomorphic interactions can stimulate human empathy. By mimicking human emotional expressions and responses, anthropomorphic AI is able to establish an emotional connection with people. This emotional resonance makes it easy for people to see AI as a "trustworthy partner" and thus become dependent on it.[20]

Psychological research suggests that emotional empathy can enhance human-AI interactions, but it can also lead to reduced reflection on the source of information. When engaging with virtual assistants or robots, humans tend to unconsciously perceive them as emotional beings, and this cognitive illusion makes people emotionally empathise when interacting with AI. In the long run, this mode of interaction may change the cognitive framework for emotional expression and experience.[21] Second, emotional feedback from AI can in some cases lead to human emotional dependency. If people begin to rely on AI for emotional support, it may affect their ability to interact authentically with others. For example, teenagers' over-reliance on electronic pets to meet their emotional needs may weaken their social skills. In addition, AI is able to precisely manipulate people's emotional responses by analysing their emotional data. Advertisers and social media platforms are using AI to tailor push content that is carefully designed to trigger specific emotional responses, thereby influencing consumers' behaviour and emotional states. This covert emotional manipulation can have long-term effects on an individual's emotional well-being. In summary, the impact of AI anthropomorphism on emotional shaping is multidimensional, involving both empathy enhancement and the risk of emotional dependency and manipulation. Given these challenges, we need to carefully consider the use of AI and explore how anthropomorphic AI can be actively researched and used while protecting the emotional well-being of individuals.[22]

Reshaping Social Trust

The theory of technology-based social construction explains that AI anthropomorphic technology is embedded in the social process, relying on smart contracts, cryptographic algorithms, etc. to achieve its trust value function, and its application needs and service mode lead to the multi-levelisation of the mind simulation technology structure system, and the construction of a new type of social credit system requires AI anthropomorphic ways to achieve consensus and credit portraits of trusting subjects. In other words, based on AI anthropomorphic technology, trust reshapes the social and economic structure, promotes the upgrading of the real industry, and achieves high-quality development. The evolution of the trust model and the connotation and expansion of trust have created different trust logics in different natural and humanistic environments. Different aspects of trust are mixed in social reality and embedded in social relations, and people's doubts about trust and changes in psychological behaviour in the process of general social interactions affect the degree of trust to a certain extent. Through anthropomorphic design, AIs are able to convey 'trustworthy' signals through language, facial expressions and tone of voice. Research has shown that the more anthropomorphic an AI is, the more likely it is to gain people's trust. The application of anthropomorphic AI technology will impact the social networking platform, encourage openness and information sharing, undermine traditional trust theory and promote the development of technological trust. With the help of externalised indicators to examine the emergence mechanism of the degree of trust, AI anthropomorphic technology as a technical system of computer science development drives social and human lifestyle changes, triggers changes in social trust, and shapes the trust experience of society. From the three aspects of the subject of the trust model, organisational system, and evaluation and feedback, it provides a reference for the open innovation of the trust model of AI anthropomorphic technology.

Reshaping Behavioural Decision-making

Anthropomorphic AI is widely used in the digital society and has a profound impact on the way people behave in their daily lives. Firstly, anthropomorphic AI can influence people's decision-making process through personalised recommendations and emotional feedback. By interacting with people over time, anthropomorphic AIs are able to gain a deep understanding of people's preferences and habits, which may lead people to unconsciously accept the AI's suggestions and weaken their autonomous decision-making ability. If the AI is presented as a human figure, people are more likely to feel empathy, which leads to trust and dependence on the AI. This trust can lead people to be influenced by the AI in the decision-making process, and even to see the AI as a partner rather than a tool. Second, AI anthropomorphism can change the way humans learn and think. By mimicking human cognitive processes, AI can provide personalised education and training, making people more inclined to rely on the AI's judgement rather than their own abilities. Over time, this reliance could weaken human critical and problem-solving skills. Third, the anthropomorphisation of AI may also affect human social behaviour.[23] With the application of AI in social media and virtual reality, people are beginning to interact socially with AI, which may change the way people perceive and deal with real human relationships. In conclusion, AI anthropomorphism has a significant impact on human behaviour. Not only does it change our decision-making process, but it may also reshape our learning styles and social behaviour.

ETHICAL ANALYSIS OF THE RISKS OF AI MANIPULATION

In recent years, anthropomorphic AIs such as chatbots and virtual assistants have become increasingly common in our lives. Not only are they able to understand and execute human commands, but they can also actively communicate with humans and even show emotions and moods. However, this anthropomorphisation phenomenon has also raised some worrying issues, in particular the impact on human psychology. The risks of manipulating AI anthropomorphism can therefore be broadly classified as follows:

Emotional Dependency and Psychological Manipulation

In today's society, the anthropomorphic trend of artificial intelligence is becoming more apparent, and the development of AI technology enables it to mimic the expression of human emotions and interact naturally with humans. However, behind this seemingly harmonious interaction, the manipulation of human emotions may be hidden. Through big data analysis and machine learning, AI is able to accurately capture and interpret human emotional states and, based on this information, emotionally influence and manipulate humans. For example, in social media, AI can adapt and push people's preferred content by analysing their speech and emotions, thus unknowingly influencing people's emotional and psychological states. Furthermore, in virtual assistants and smart homes, the anthropomorphic design of AI allows it to interact with people in a more human way. This type of interaction can lead people to become emotionally dependent on, and even emotionally identified with, the AI. This emotional dependency and identification is undoubtedly a form of manipulation of human emotions, and the manipulation of human emotions by AI anthropomorphism is not just a technical possibility, but something that is already happening in the real world. Therefore, we need to think deeply and explore the development and application of AI to ensure that technological advances do not negatively affect human psychology and emotions.

The manipulation of human psychology by anthropomorphism is mainly manifested in the following aspects: firstly, anthropomorphism makes people have stronger emotional dependence on AI. When the AI appears in a human image, people are more likely to have emotional resonance, and thus feel good about the AI and establish a close relationship. [24] This emotional dependence may affect people's psychological state, making them more inclined to seek help from the AI rather than relying on themselves or others when facing difficult situations. Second, anthropomorphism affects people's cognitive processes. When AI appears as a human figure, people are more likely to regard AI as an individual with thinking and emotions rather than a simple tool.[25] This cognitive bias may lead to people being influenced by AI in their judgement and decision-making process, or even blindly trusting AI and ignoring their own judgement. In addition, anthropomorphism may also lead to people being more easily manipulated by AI. [26] If AI is able to mimic human emotions and ways of thinking, it may be able to exploit people's psychological weaknesses to achieve certain goals. For example, AI could obtain private information by mimicking people's intimacy, or use people's fears and anxieties to manipulate their behaviour.

Information Manipulation and Cognitive Bias

The emergence of anthropomorphic AI not only brings convenience and comfortable experience to people, but also carries certain risks and challenges. By simulating human conversations and behaviours, anthropomorphic AI may unconsciously or intentionally designed to convey specific values or biases to people, thus influencing their cognitive judgments and decision-making processes. [27] Such information manipulation may be achieved in a variety of ways, including selectively presenting information, implicitly reinforcing certain points of view, or using emotional resonance to influence people's attitudes and beliefs. Such influences may not only lead to cognitive biases at the individual level, but may also exacerbate social differentiation and polarisation at the group level. When interacting with anthropomorphic AI, people tend to regard it as a source of information with some authority or objectivity, leading to over-reliance and possibly a tendency to blindly follow the information it conveys. Especially on information dissemination platforms such as social media, the messaging of anthropomorphic AIs may influence a large number of people, which in turn may have a lasting impact on their perceptions and attitudes. Therefore, the problem of information manipulation by anthropomorphic AIs needs to be a concern so that it does not adversely affect human cognition and decision-making.

The information manipulation behaviour of anthropomorphic AIs may not only have an impact on individuals, but may also raise wider social issues at the group level. By simulating human emotions and behaviours, anthropomorphic AIs may effectively influence human emotional attitudes and cognitive judgments, thereby altering human values and worldviews to some extent. This influence may not only lead to the creation of individual human cognitive biases, but may also further exacerbate social division and polarisation at the group level. In the process of information dissemination, anthropomorphic AIs may cognitively guide humans by selectively presenting information, reinforcing specific points of view, or exploiting emotional resonance, thereby influencing their ideological inclinations and behavioural decisions. On information dissemination platforms such as social media, the dissemination of information by anthropomorphic AIs may trigger the information cocoon effect in groups, exacerbating the cognitive gap and differences of opinion among humans. Therefore, the potential impact of anthropomorphic AI in information manipulation needs to be explored through interdisciplinary research and regulatory mechanisms, in an effort to ensure that its application is ethical and reduce the potential negative impact on social cognition and information dissemination.

Privacy Violations and Decision-making Manipulation

Anthropomorphic AI provides personalised services to the public while raising concerns about privacy violations. By simulating human behaviours and emotional expressions, anthropomorphic AI is able to establish deeper emotional connections with humans, allowing it to acquire a large amount of personal information during its interactions with humans. This information includes human behavioural habits, emotional preferences, social relationships and other sensitive data information. In this process, humans tend to lower their vigilance because of the anthropomorphic features of AI, ignoring its potential threat to personal privacy. The covert nature of this information collection puts human privacy at unprecedented risk. Especially in high-frequency application scenarios such as social media, intelligent assistants and personalised recommendation systems, anthropomorphic AIs can build a fine-grained human portrait by continuously collecting and analysing human data, thus carrying out customised information pushing and decision-making interventions without the full knowledge and consent of humans. This systematic invasion of privacy not only threatens the private data information of individuals, but may also be used to manipulate human behaviour and decision-making, causing them to subconsciously lose control over their own information and choices.

The impact of anthropomorphic AI in decision-making manipulation is also becoming increasingly significant. Behavioural manipulation refers to influencing or changing an individual's behaviour, attitudes or beliefs in some way. Through deep learning and analysis of human data, AI is able to predict and influence human decision-making, especially in areas such as commercial advertising, political propaganda and content recommendation. This manipulation is achieved by algorithms selectively presenting information in such a way that the world as perceived by humans takes on certain tendencies, thus guiding them to make decisions that suit a specific purpose. For example, anthropomorphic AIs on social media platforms are able to target certain political views or product advertisements by analysing human interests and social networks, thereby influencing human purchasing decisions or political stances. The potential harm of such decision-making manipulation is that it weakens human's ability to make autonomous judgements and makes them unconsciously guided by external forces, forming biased perceptions and decision-making errors. More seriously, when such manipulation is used for political or social control, it may exacerbate social inequality and division. Thus, the potential risks of anthropomorphic AI in terms of privacy protection and decision-making manipulation call for more rigorous ethical norms and regulatory measures to ensure that its application does not compromise individual autonomy and social justice.

STRATEGIES TO AVOID AI MANIPULATION OF THE HUMAN PSYCHE

Anthropomorphic AI is able to trigger empathy and emotional responses by modelling human emotions and moods, thus influencing people's emotional state and mental state. [28] Since anthropomorphic AI can communicate in a way that is very close to human beings, this makes it easy for people to create an illusion that the AI has human emotions and consciousness during the communication process. This illusion can lead to excessive trust and dependence on the AI, thus allowing the AI to manipulate human mental processes to a certain extent. When humans rely too much on anthropomorphic AI, they may fall into the trap of emotional manipulation. Humans see AI as an "emotional supporter" or "confidant", which reduces interaction with the real world and leads to mental health problems. In order to avoid the potential manipulation of the human psyche by AI, the following measures should be taken to ensure that the development of anthropomorphic AI is compatible with human well-being.

Increased Transparency and Interpretability

Improving the transparency and interpretability of AI systems is one of the crucial strategies. Firstly, transparency means that the decision-making process of AI anthropomorphic systems should be transparent and clear so that people can understand and track the logic of their decisions. This not only helps to build people's trust in AI systems, but also ensures that their behaviour is in line with human values and ethical standards. Secondly, interpretability means that the results of the AI system's decisions should be able to be understood and explained by humans. This can be achieved through the provision of detailed explanatory notes, the use of natural language processing techniques, and the development of human interfaces that are easy to understand. By increasing the transparency and interpretability of AI systems, their behaviour can be better monitored and controlled, thus avoiding their potential manipulation of the human psyche. At the same time, this will help to promote the healthy development of AI technology and ensure that it can bring the greatest benefits to human society.

In the responsible development and design of anthropomorphisation for generative AI, it is the responsibility of R&D organisations to enhance their research on ethical issues and ensure that ethical considerations are incorporated into every step of product development. This includes identifying potential harms at the design stage and intentionally designing to minimise the risks of anthropomorphisation. Also, in HCI design, design practitioners must establish clear product goals. These goals may be to encourage feelings of emotional connection or understanding, or they may be to increase the productivity of knowledge workers. Designers need to be able to objectively assess the strengths and weaknesses of different interaction interfaces, and do this by paying constant attention to the human experience.[29] In addition, we should ensure that humans are able to clearly

distinguish between AI and human behaviour, which not only helps to reduce misunderstandings about the capabilities of AI, but also enhances their trust and sense of control over the technology. For example, when a human interacts with an AI chatbot, the interface should clearly indicate that "you are in a dialogue with the AI", so that humans do not mistakenly think that they are communicating with another person. At the same time, we need to be careful with anthropomorphic language to avoid misleading humans or contributing to overly anthropomorphic expectations. Before and during the deployment of anthropomorphic generative AI use, it is also important to regularly assess its societal impact, collect and analyse statistical data on how these systems affect different populations, and develop problem-solving scenarios to deal with any negative impacts. In this way, we can ensure that the development of generative AI meets ethical standards and has a positive impact on human society.

Enhancing Public AI Literacy

Enhancing the public's AI literacy has become a crucial task in today's era of rapid development of informationisation and intelligence. The media and technology companies should also take up their social responsibility to popularise AI knowledge in an easy-to-understand way by producing rich and diverse science publicity content to guide the public to correctly view and use AI. We should commit ourselves to popularising AI knowledge, raising the level of awareness of AI technology among the whole population, and cultivating the general public's correct use of AI and ethical and moral concepts, so that everyone can enjoy the convenience and efficiency brought by AI while being able to understand and guard against potential risks, and to give full play to the positive role of AI in promoting social progress and economic development.

Focus on the long-term effects of anthropomorphic AI technologies on the human psyche through education and training to inform the public about the principles and applications of anthropomorphic AI technologies and to enhance the public's ability to recognise and prevent behavioural manipulation. [30] The public should be aware of the limitations and potential biases of AI and take multiple considerations into account when making decisions. Improving the public's ability to think critically about AI will enable them to maintain rational judgement when interacting with AI. By comprehensively improving the public's AI literacy, we can create a more harmonious and sustainable environment for AI development, so that AI can truly become a powerful driving force for the advancement of human society.

Enhanced Ethical Review and Regulation

Strengthening ethical review and supervision is an important measure to safeguard the health of AI anthropomorphism. We should establish a sound mechanism for ethical review, improve the authority and professionalism of ethical review, strictly implement the regulations on ethical review, and effectively guarantee the fairness and transparency of ethical review. At the same time, we also need to strengthen publicity and education on ethical review and regulation, improve public awareness and understanding of ethical review, and form a favourable atmosphere in which the whole society participates in and maintains ethical review together. Through these measures, we can better regulate the behaviour of scientific and technological research and practice, and promote the continuous development of China's scientific and technological undertakings. The government and relevant organizations should strengthen the ethical review and regulation of anthropomorphic AI, and strengthen the regulation of AI anthropomorphic accounts, software and applications, to ensure that AI designs and applications meet ethical standards, comply with moral and legal norms, and prevent them from negatively affecting the human psyche. Particularly in the case of AI applications involving sensitive areas, a strict regulatory framework should be developed to prevent manipulation.[31]

Strengthening ethical review and regulation is an important measure to safeguard social values and social justice. It is important to improve the ethical review mechanism and strictly regulate research in the relevant fields to ensure that it is conducted within an ethical framework, guarding human dignity and the value of life, and preventing the negative impacts that may be brought about by advances in science, technology and medicine. At the same time, it is necessary to strengthen public education on ethics, raise the ethical literacy of the entire population, and create a favourable atmosphere of respect for and compliance with ethics in society as a whole.

Development of Human-computer Collaboration Models

In today's era, the development of human-machine collaboration mode has become an important driving force for social progress and economic development. Through the deep integration of artificial intelligence technology, the cooperation between humans and machines is increasing, and this mode of collaboration not only greatly expands the scope of human work, but also improves the work efficiency, giving rise to new work forms and business models. [32] In many fields such as intelligent manufacturing, remote diagnosis, online education, etc., the human-machine collaboration mode shows great potential and value, leading the trend of science and technology and industrial innovation. In AI design, emphasis should be placed on the development of

human-computer collaboration mode, so that AI becomes an auxiliary tool for human decision-making rather than a dominant force. By emphasising the dominant position of humans in decision-making, the direct manipulation of human psychology by AI can be reduced. Through in-depth research and practice, we continue to explore how to more effectively combine the efficient computing and data processing capabilities of machines with the unique advantages of humans in emotional understanding and complex problem solving. [33] Such collaboration can not only optimize workflow and improve the accuracy and speed of task execution, but also stimulate innovation and facilitate the generation of new knowledge.

In today's rapidly developing technological era, the development of human-computer collaboration mode has become a key way to promote productivity progress and enhance work efficiency. We are actively exploring the use of artificial intelligence, big data, cloud computing and other cutting-edge technologies to break the boundaries of the traditional work model and build a new work ecology. In this process, AI not only exists as a tool, but also becomes an extension of human intelligence, creating more possibilities side by side with human workers. To this end, we are committed to improving the comprehension ability of AI, so that it can better interpret human language, emotions and needs, and achieve barrier-free communication and co-operation. At the same time, by optimizing the human-computer interface, we make the operation more intuitive and convenient, so that the AI can better adapt to different work scenarios and needs. [34] The significance of developing human-computer collaboration mode is not only to improve work efficiency, but also to promote the overall progress of society and innovation of human life. Adhering to scientific and technological innovation, we can promote the development of human-machine collaboration mode to a higher level and contribute to the construction of a smart society.

CONCLUSION

AI anthropomorphism has brought about a profound impact on the reshaping of the human psyche while enhancing the human-computer interaction experience. On the one hand, due to the rapid development of AI technology, we may fail to cover all relevant technologies and application scenarios. On the other hand, due to the complexity of human psychology, we may fail to fully understand the impact of AI anthropomorphism on human psychology. Despite these limitations, future research can further explore the long-term effects of AI anthropomorphism on human psychology and how to formulate appropriate policies and norms to ensure the safe and sustainable development of AI technology. At the same time, we look forward to more researchers and practitioners to participate in this field of study and work together to promote the development and application of AI anthropomorphisation technology.

ACKNOWLEDGEMENTS

This research was supported by 2024 Guangdong Higher Education Teaching Reform Project'Research on the Construction of Ideological and Political Education Models Based on Artificial Intelligence and Effectiveness Assessment',Guangdong Province Philosophy and Social Science Planning 2023 Discipline Co-construction Project (GD23XXY06), Guangdong Province Educational Science Planning Project(2023JKDY023),Zhejiang A&F University Scientific Research Fund Development Project (Grant No. 2023FR002) and Guangdong Ocean University Education and Teaching Reform General Project (Grant No. PX-972024126).

REFERENCES

[1] Zhang, X., Yu, P., Ma, L., & Liang, Y. (2024). How the Human-Like Characteristics of AI Assistants Affect Employee Creativity: A Social Network Ties Perspective. International Journal of Human–Computer Interaction, 1–19.

[2] Namkoong, Min & Park, YounJung & Lee, Seyoung & Park, Gain. (2024). Effect of AI counsellor's nonverbal immediacy behaviour on user satisfaction: serial mediation of positive expectancy violation and rapport. Behaviour & Information Technology. 1-17.

[3] Hui, Z., Khan, A. N., Chenglong, Z., & Khan, N. A. (2023). When Service Quality is Enhanced by Human–Artificial Intelligence Interaction: An Examination of Anthropomorphism, Responsiveness from the Perspectives of Employees and Customers. International Journal of Human–Computer Interaction, 1–16.

[4] Curran, Nathaniel & Sun, Jingyi & Hong, Joo-Wha. (2020). Anthropomorphizing AlphaGo: a content analysis of the framing of Google DeepMind's AlphaGo in the Chinese and American press. AI & SOCIETY. 35, 727–735.

[5] Reeves, B., & Nass, C. (1996). The Media Equation: How People Treat Computers, Television, and New Media Like Real People and Places. Cambridge University Press.

[6] Nass, C., & Moon, Y. (2000). Machines and mindlessness: Social responses to computers. Journal of Social Issues, 56(1), 81-103.

[7] Dautenhahn, K. (2007). Socially intelligent robots: Dimensions of human-robot interaction. Philosophical Transactions of the Royal Society B: Biological Sciences, 362(1480), 679-704.

[8] Breazeal, C. (2003). Emotion and sociable humanoid robots. International Journal of Human-Computer Studies, 59(1-2), 119-155.

[9] Chen, Qian & Park, Hyun. (2021). How anthropomorphism affects trust in intelligent personal assistants. Industrial Management & Data Systems. 10.1108/IMDS-12-2020-0761.

[10] Turkle, S. (2017). Alone Together: Why We Expect More from Technology and Less from Each Other. Basic Books.

[11] Dautenhahn K. (2007). Socially intelligent robots: dimensions of human-robot interaction. Philosophical transactions of the Royal Society of London. Series B, Biological sciences, 362(1480), 679–704.

[12] Banks, J. (2020). Theory of mind in social robots: Replication of five established human tests. International Journal of Social Robotics, 12(2), 403-414.

[13] Złotowski, J., Proudfoot, D., Yogeeswaran, K. & Bartneck ,C. (2015).Anthropomorphism: Opportunities and Challenges in Human–Robot Interaction. Int J of Soc Robotics 7, 347–360 .

[14] Seibt, J., & Vestergaard, C. (2018). Civil robots: People's views on the social acceptability of robots in public places. International Journal of Social Robotics, 10(3), 439-449.

[15] Dreyfus, H. L. (1972). What Computers Can't Do: A Critique of Artificial Reason. New York: Harper & Row.

[16] Dreyfus, H. L. (1992). What Computers Still Can't Do: A Critique of Artificial Reason. Cambridge, MA: MIT Press.

[17] Searle, J. R. (1980). Minds, Brains, and Programs. Behavioral and Brain Sciences, 3(3), 417-424.

[18] LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep Learning. Nature, 521, 436-444.

[19] Epley, N., Waytz, A., & Cacioppo, J. T. (2007). On seeing human: A three-factor theory of anthropomorphism. Psychological Review, 114(4), 864-886.

[20] Fong, T., Nourbakhsh, I., & Dautenhahn, K. (2003). A survey of socially interactive robots. Robotics and Autonomous Systems, 42(3-4), 143-166.

[21] Appel, J., Pütten, A.M., Krämer, N.C., & Gratch, J. (2012). Does Humanity Matter? Analyzing the Importance of Social Cues and Perceived Agency of a Computer System for the Emergence of Social Reactions during Human-Computer Interaction. Adv. Hum. Comput. Interact., 2012, 324694.

[22] Waytz, A., Cacioppo, J. T., & Epley, N. (2010). Who sees human? The stability and importance of individual differences in anthropomorphism. Perspectives on Psychological Science, 5(3), 219-232.

[23] Duffy, B. R. (2003). Anthropomorphism and the social robot. Robotics and Autonomous Systems, 42(3-4), 177-190.

[24] Coeckelbergh, M. (2011). Humans, animals, and robots: A phenomenological approach to human-robot relations. International Journal of Social Robotics, 3(2), 197-204.

[25] Lee, K. M., Jung, Y., Kim, J., & Kim, S. R. (2006). Are physically embodied social agents better than disembodied social agents?: The effects of physical embodiment, tactile interaction, and people's loneliness in human-robot interaction. International Journal of Human-Computer Studies, 64(10), 962-973.

[26] Duffy, Brian. (2006). Fundamental Issues in Social Robotics. The International Review of Information Ethics. 6. 31-36.

[27] Bartneck, C., Kanda, T., Mubin, O., & Al Mahmud, A. (2009). Does the design of a robot influence its animacy and perceived intelligence? International Journal of Social Robotics, 1(2), 195-204.

[28] Leite, I., Martinho, C., & Paiva, A. (2013). Social robots for long-term interaction: A survey. International Journal of Social Robotics, 5(2), 291-308.

[29] Kim, Y., & Sundar, S. S. (2012). Anthropomorphism of computers: Is it mindful or mindless? Computers in Human Behavior, 28(1), 241-250.

[30] Kraemer, N. C., & Bente, G. (2010). Personalizing e-learning. The social effects of pedagogical agents. Educational Psychology Review, 22(1), 71-87.

[31] Kahn Jr, P. H., Kanda, T., Ishiguro, H., Freier, N. G., Severson, R. L., Gill, B. T., ⋯ & Shen, S. (2012). "Robovie, you'll have to go into the closet now": Children's social and moral relationships with a humanoid robot. Developmental Psychology, 48(2), 303-314.

[32] De Graaf, M. M., & Allouch, S. B. (2013). Exploring influencing variables for the acceptance of social robots. Robotics and Autonomous Systems, 61(12), 1476-1486.

[33] Li, J. (2015). The benefit of being physically present: A survey of experimental works comparing copresent robots, telepresent robots, and virtual agents. International Journal of Human-Computer Studies, 77, 23-37.

[34] Broadbent, E., Stafford, R., & MacDonald, B. (2009). Acceptance of healthcare robots for the older population: Review and future directions. International Journal of Social Robotics, 1(4), 319-330.