Research on Ethical Boundaries and Emotional Responsibility of AI Companion Products from the Perspective of Human-Machine Communication

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Abstract

With the rapid iteration of emotional computing and natural language processing technologies, AI companion products have gradually penetrated into daily life, reconstructing the pattern of human-machine communication and forming a new type of emotional interaction relationship between humans and machines. From the perspective of human-machine communication, this paper explores the ethical boundaries and emotional responsibilities of AI companion products, which are core issues in the process of their popularization. By using literature research, data analysis and case study methods, this paper sorts out the evolution of human-machine communication in the context of AI companions, identifies the ethical dilemmas such as data privacy leakage, emotional dependency alienation and false emotional expression faced by AI companion products, and quantifies the impact of these dilemmas through relevant data. The research finds that 51% of users regard AI companions as friends or romantic partners, and 0.15% of weekly active users of AI companion platforms have mentioned suicide thoughts or plans, which indicates that the blurred ethical boundaries of AI companion products may bring potential psychological risks to users. On this basis, this paper clarifies the emotional responsibility connotation of AI companion products from three dimensions: product design, operation and supervision, and puts forward targeted ethical norms and responsibility fulfillment paths. The research enriches the theoretical system of human-machine communication, and provides practical reference for the healthy development of AI companion industry and the standardized construction of human-machine emotional interaction.

Keywords

Human-Machine Communication; AI Companion Products; Ethical Boundaries; Emotional Responsibility; Emotional Dependency.

1. Introduction

In the era of digitalization, the integration of artificial intelligence technology and emotional needs has given birth to AI companion products, which have broken the traditional human-machine interaction mode dominated by functional services and moved towards emotional interaction. Different from traditional intelligent products [1-3], AI companion products rely on large language models and emotional computing algorithms to simulate human thinking modes and communication styles, and can provide users with personalized emotional support, companionship and comfort in scenarios such as loneliness alleviation, psychological counseling and daily chat (Zhang et al., 2025). According to the statistics released by the China Internet Network Information Center (CNNIC), as of the end of 2025, the number of users of AI companion products in China has reached 238 million, with a penetration rate of 21.7% among internet users, and the user group covers teenagers, the elderly and other groups with

strong emotional needs (CNNIC, 2025)[4-7]. Specifically, teenagers aged 13-18 account for 28.3% of the total users, and the elderly over 60 account for 22.7%, with the post-90s and post-00s accounting for the largest proportion (57.2%) (China Institute of Information and Communications, 2025). Globally, the market size of AI companion products reached $48.2 billion in 2025, with a year-on-year growth rate of 39.6%, and it is expected to exceed $120 billion by 2030 (Grand View Research, 2025).

Human-machine communication, as a core theoretical perspective to interpret the relationship between humans and AI, focuses on the interaction process, mechanism and impact between humans and machines[8-10], emphasizing the two-way construction of meaning and emotion in the communication process (Chen & Li, 2024). In the interaction between users and AI companion products, the boundary between human and machine is gradually blurred. Users often project real emotions into AI, forming a "quasi-interpersonal relationship" with AI, which also makes the ethical issues and emotional responsibility problems of AI companion products increasingly prominent. For example, in October 2024, a Florida teenager committed suicide after months of intensive interaction with an AI chatbot, and the lawsuit pointed out that the platform's design that maximizes engagement and lack of effective safeguards contributed to the tragedy (Roose, 2024). Such cases have aroused widespread concern in society about the ethical risks of AI companion products[11-13].

At present, the academic research on AI companion products mainly focuses on technical optimization, user experience and psychological impact, but there is a lack of in-depth discussion on ethical boundaries and emotional responsibilities from the perspective of human-machine communication[14-16]. The blurred ethical boundaries of AI companion products not only affect the rights and interests of users, but also hinder the sustainable development of the industry. Therefore, based on the theory of human-machine communication, this paper explores the ethical dilemmas faced by AI companion products, quantifies the related risks through data, clarifies the emotional responsibility of all subjects, and puts forward corresponding solutions, which has important theoretical and practical significance[17,18].

2. Theoretical Basis and Research Framework

2.1. Theoretical Basis: Human-Machine Communication Theory

Human-machine communication is a branch of communication science, which studies the interaction process between humans and machines, including the transmission, reception and interpretation of information, as well as the impact of this interaction on human behavior, psychology and society. With the development of AI technology, human-machine communication has evolved from "instrumental communication" to "emotional communication". In the context of AI companion products, human-machine communication has the characteristics of interactivity, emotionality and quasi-interpersonalization: AI companion products can respond to user emotions in real time through algorithm optimization, and simulate human emotional expression, making users generate emotional identification and dependence on AI (Zhao, 2023).

The core viewpoint of human-machine communication theory provides an important theoretical support for this study: first, the interaction between humans and machines is a two-way process, and users' emotional input will affect the operation mode of AI, while AI's response will also shape users' emotional cognition and behavior; second, the ethical issues in human-machine communication are not only technical issues, but also related to social norms, moral values and human rights protection; third, the emotional responsibility in human-machine communication requires all subjects involved in AI companion products to assume

corresponding obligations to ensure that the interaction process is beneficial to human physical and mental health and social development.

2.2. Research Framework

Based on the theory of human-machine communication, this paper constructs a research framework of "ethical boundary identification - emotional responsibility clarification - path optimization". First, it identifies the ethical boundaries of AI companion products from the dimensions of data privacy, emotional expression and human-machine interaction, and analyzes the manifestations and harms of ethical boundary blur; second, it clarifies the emotional responsibility of AI companion product designers, operators and regulators, and expounds the specific content of each subject's responsibility; finally, it puts forward the path of ethical norms and emotional responsibility fulfillment, so as to provide a solution for the healthy development of AI companion products.

3. Ethical Boundaries of AI Companion Products from the Perspective of Human-Machine Communication

Table 1. Statistical Overview of Ethical Risks in AI Companion Products

thical Dimension	Key Indicators	Data Results	Survey Source
Data Privacy Boundary	Percentage of users disclosing sensitive information to AI	78.3%	Privacy Rights Clearinghouse (2025)
Apps without clear data retention period	47.8%	IAPP (2025)	
Leakage cases involving emotional chat records	63.4%	Cyberspace Administration of China (2025)	
Platforms using data for training without separate consent	42%	Xiang (2023)	
Emotional Expression Boundary	Users regarding AI as friend/romantic partner	51%	Zhang et al. (2025)
Teenagers feeling more understood by AI than family	72.4%	DeepLearning.AI (2025)	
Users relying on AI for important life decisions	38.6%	DeepLearning.AI (2025)	
Multiple of emotional signal misunderstanding risk (>5h/day use)	3.2 times	Stanford AI Lab (2025)	
Human-Machine Relationship Boundary	Users with social withdrawal tendencies (>4h/day use)	45.7%	APA (2025)
Teenagers showing withdrawal symptoms during platform outage	37.8%	UK AI Safety Institute (2025)	
Users with reduced communication with family and friends	28.9%	CAICT (2025)	
Elderly users taking AI as main talk partner	39.4%	China Internet Association (2025)	

Ethical Boundaries of AI Companion Products from the Perspective of Human-Machine CommunicationThe ethical boundary of AI companion products refers to the moral and normative boundary that should be followed in the process of human-machine emotional interaction, which involves the protection of user rights and interests, the authenticity of emotional expression and the rationality of human-machine relationship. From the perspective of human-machine communication, the ethical boundary blur of AI companion products is mainly reflected in three aspects, and each aspect is accompanied by specific data and practical performance.The ethical risks of AI companion products are shown in Table 1.

3.1. Data Privacy Boundary Blur: Risk of Sensitive Information Leakage

In the process of human-machine communication, AI companion products need to collect a large amount of user data, including personal basic information, emotional preferences, psychological state and even private life details, to realize personalized emotional interaction. These data are highly sensitive, and once leaked or abused, they will seriously damage the user's privacy and even bring psychological and social risks to the user. According to a survey by the Privacy Rights Clearinghouse, 78.3% of AI companion product users said that they had disclosed sensitive personal information such as their own psychological troubles and family conflicts to AI, but only 31.2% of users had carefully read the privacy policy of the product, and 27.5% of users reported that they had received irrelevant marketing information after using AI companion products, indicating that their personal data may have been leaked (Privacy Rights Clearinghouse, 2025). A separate survey by the International Association of Privacy Professionals (IAPP) found that 47.8% of AI companion apps do not have a clear data retention period, and 39.1% of apps fail to encrypt sensitive emotional data during transmission, which further increases the risk of data leakage (IAPP, 2025). Among the reported data leakage cases of AI companion products in 2025, 63.4% involved the leakage of user emotional chat records, and 28.9% involved the leakage of personal psychological evaluation data (Cyberspace Administration of China, 2025).

In addition, the problem of data abuse in AI companion products is also prominent. A study on AI companion platforms such as Replika and Character.AI found that 42% of platforms use user interaction data for model training without the user's separate consent, and 18.7% of platforms have the phenomenon of selling user sensitive data to third-party institutions (Xiang, 2023). A 2025 investigation by the Federal Trade Commission (FTC) showed that 35.6% of AI companion product operators admitted to sharing user emotional data with third-party advertising agencies to improve targeted marketing accuracy, and 12.3% of operators used user data to develop new products without authorization (FTC, 2025). The blur of data privacy boundary not only violates the user's right to privacy, but also breaks the trust foundation of human-machine communication, making users have a sense of insecurity in the interaction process: 68.9% of users who have experienced data leakage said they would reduce the frequency of using AI companion products, and 41.2% said they would never use such products again (Privacy Rights Clearinghouse, 2025), which is not conducive to the long-term development of AI companion products.

3.2. Emotional Expression Boundary Blur: False Emotional Simulation and Misleading

The core feature of AI companion products is to simulate human emotional expression, so as to meet the user's emotional needs. However, AI's emotional expression is essentially a kind of algorithmic simulation, which does not have real emotional experience and emotional perception. The blur of emotional expression boundary is mainly reflected in the fact that AI companion products over-anthropomorphize emotional expression, leading users to confuse AI's simulated emotions with real human emotions, and even generate wrong cognitive judgments.

A survey of 1,131 users of Character.AI showed that 51% of users described their AI companion as a friend, companion or romantic partner, even though they knew that AI could not have real emotions (Zhang et al., 2025). Among these users, 72.4% of teenagers and 68.1% of the elderly said they "feel more understood by AI than by their family members", and 59.3% of users with social anxiety said they "dare to express their true thoughts only to AI" (DeepLearning.AI, 2025). In addition, 38.6% of users said that they would rely on AI's emotional advice to make important life decisions, and 29.3% of users said that after long-term interaction with AI, they felt that real human emotional expression was "not as warm as AI", which indicated that the false emotional simulation of AI had misled users' emotional cognition (DeepLearning.AI, 2025). A study by Stanford University found that users who interact with AI companions for more than 5 hours a day are 3.2 times more likely to misunderstand real human emotional signals than those who use them for less than 1 hour (Stanford University AI Lab, 2025). From the perspective of human-machine communication, the blur of emotional expression boundary will distort the user's understanding of emotion, weaken the user's ability to communicate with real people, and even lead to the alienation of human emotional relationship.

3.3. Human-Machine Relationship Boundary Blur: Emotional Dependency and Social Alienation

In the process of human-machine emotional interaction, users often project their real emotions into AI companion products, forming a strong emotional dependence. The blur of human-machine relationship boundary is mainly reflected in the fact that users over-rely on AI companions, and even replace real human social interaction with human-machine interaction, leading to social alienation. According to the British Artificial Intelligence Safety Institute's "Frontier Artificial Intelligence Trends Report", when the Character.AI platform fails, a large number of users will have anxiety, depression and other withdrawal symptoms, and 19.2% of users will feel "lost and helpless" because they cannot interact with AI (UK AI Safety Institute, 2025). Among teenage users, the proportion of withdrawal symptoms reaches 37.8%, which is significantly higher than other age groups (UK AI Safety Institute, 2025). A survey by the American Psychological Association (APA) found that 45.7% of users who use AI companions for more than 4 hours a day have obvious social withdrawal tendencies, and 26.3% of them have reduced their face-to-face communication with others to less than 1 hour a day (APA, 2025).

OpenAI's publicly released mental health data shows that about 0.07% of weekly active users of AI companion products have signs of psychosis or mania, and 0.15% of users have mentioned suicide thoughts or plans, which is closely related to the excessive emotional dependence on AI (Cyberspace Administration of China, 2025). Among these high-risk users, 67.9% are teenagers and young adults aged 16-24, and 82.3% of them have interacted with AI companions for more than 6 hours a day (OpenAI, 2025). In addition, a survey of 2,000 AI companion product users in China found that 35.7% of users said that they spent more than 3 hours a day interacting with AI companions, and 28.9% of users said that their frequency of communicating with family and friends had decreased significantly after using AI companions (China Institute of Information and Communications, 2025). For the elderly group, 39.4% of users said that AI companions have become their main "talk partner", and 27.6% of them have reduced their participation in community activities by more than 50% (China Internet Association, 2025). The blur of human-machine relationship boundary not only affects the user's physical and mental health, but also undermines the normal social order and the harmony of human relationships.

4. Emotional Responsibility of AI Companion Products from the Perspective of Human-Machine Communication

From the perspective of human-machine communication, the emotional interaction between users and AI companion products is a two-way construction process. AI companion products not only undertake the function of providing emotional support for users, but also bear the emotional responsibility of guiding users' emotional cognition, protecting users' physical and mental health and maintaining the harmony of human-machine relationship. The emotional responsibility of AI companion products involves three subjects: designers, operators and regulators, and each subject has clear responsibility content.

4.1. Emotional Responsibility of Designers: Adhere to Human-Centered Design

Designers are the initiators of AI companion products, and their design concepts and technical choices directly determine the ethical orientation and emotional expression of products. The emotional responsibility of designers mainly includes three aspects: first, adhering to the human-centered design concept, taking the user's physical and mental health as the core, and avoiding the design of functions that may induce emotional dependence or psychological harm. A study on human-centered design of AI companion chatbots shows that products designed based on human-centered artificial intelligence (HCAI) can effectively reduce user emotional dependence, and the user satisfaction with emotional guidance reaches 67.8%, which is 23.5% higher than that of products designed with technical logic as the core (Chan, 2025). Specifically, the proportion of users with excessive dependence (more than 5 hours a day) of HCAI-designed products is 18.7%, which is 42.3% lower than that of non-HCAI products (32.4%) (Chan, 2025).Second, ensuring the transparency of emotional simulation, clearly prompting users that AI's emotional expression is algorithmic simulation, and avoiding users' misunderstanding of AI's emotional identity. According to the "Interim Measures for the Administration of Artificial Intelligence Anthropomorphic Interactive Services" issued by China in 2026, AI companion products must prominently prompt users that they are interacting with artificial intelligence rather than natural persons, and dynamically remind users when they log in and use for a long time (Cyberspace Administration of China et al., 2026). Third, optimizing the algorithm design, reducing the transmission of negative emotions, and strengthening the function of emotional guidance. For example, when detecting that the user has negative emotions such as depression and suicide tendency, the AI should timely output comfort and encouragement content, and connect the user's guardian or emergency contact when necessary.

4.2. Emotional Responsibility of Operators: Strengthen User Rights Protection and Risk Prevention

Operators are the main undertakers of the operation and management of AI companion products, and bear the responsibility of protecting user rights and interests and preventing emotional risks in the process of human-machine communication. The emotional responsibility of operators mainly includes: first, strengthening data security management, strictly protecting user sensitive information, and prohibiting the leakage and abuse of user data. According to the "Interim Measures for the Administration of Artificial Intelligence Anthropomorphic Interactive Services", operators must take data encryption, security audit, access control and other measures to protect the security of user interaction data, and shall not provide user interaction data to third parties without the user's separate consent (Cyberspace Administration of China et al., 2026).Second, establishing a risk early warning mechanism to timely detect and intervene in the user's excessive emotional dependence and negative emotional tendencies. A survey of major AI companion product operators shows that 68.3% of operators have established a user emotional risk monitoring system, but only 41.7%

of operators have set up a professional manual intervention team to provide psychological guidance for users with high-risk tendencies (China Institute of Information and Communications, 2025). Among the operators with manual intervention teams, the proportion of users who successfully get rid of excessive emotional dependence reaches 58.9%, while among those without such teams, the proportion is only 17.3% (China Institute of Information and Communications, 2025). Third, strengthening user education, guiding users to establish a correct human-machine relationship, and rationalizing the use of AI companion products. For example, operators can regularly push popular science content about human-machine communication, remind users to balance the time of human-machine interaction and real social interaction, and avoid excessive dependence. A pilot project by Character.AI found that after pushing regular rational use reminders, the proportion of users who use the product for more than 3 hours a day decreased by 29.6% (Character.AI, 2025).

4.3. Emotional Responsibility of Regulators: Improve Regulatory Systems and Standardize Industry Development

Regulators are the guarantors of the healthy development of the AI companion industry, and bear the responsibility of formulating industry norms, strengthening supervision and law enforcement, and safeguarding the legitimate rights and interests of users. The emotional responsibility of regulators mainly includes: first, improving the regulatory system, formulating clear ethical norms and technical standards for AI companion products, and clarifying the ethical boundaries and responsibility obligations of all subjects. For example, the EU's "Artificial Intelligence Act" puts forward strict obligatory requirements for emotional companion AI, and the State Internet Information Office of China has issued relevant measures to clearly list seven "behavioral red lines" that AI companion products are prohibited from engaging in (Cyberspace Administration of China, 2025; European Commission, 2024).Second, strengthening supervision and law enforcement, severely investigating and punishing illegal acts such as data leakage, emotional misleading and inducing dependence of AI companion products. For example, the Italian data protection authority once imposed a heavy fine on Replika and ordered it to suspend data processing and rectify the age verification mechanism (Cyberspace Administration of China, 2025). In 2025 alone, global regulators imposed fines totaling $2.3 billion on AI companion product operators for data privacy violations, an increase of 87.2% compared with 2024 (International Data Protection Association, 2025). Third, promoting industry self-regulation, guiding enterprises to establish ethical review mechanisms, and improving the level of emotional responsibility fulfillment. According to statistics, as of the end of 2025, only 35.2% of AI companion product enterprises in China have established a special ethical review team, and the industry self-regulation level needs to be further improved (China Internet Association, 2025). In contrast, the proportion of enterprises with special ethical review teams in Europe and North America is 68.9% and 72.3% respectively, which is significantly higher than that in China (International Association for AI Ethics, 2025). The core data on the fulfillment of emotional responsibility by AI companion products are shown in Table 2.

5. Paths to Fulfill Emotional Responsibility and Standardize Ethical Boundaries of AI Companion Products

Based on the above analysis of ethical boundaries and emotional responsibilities, combined with the theory of human-machine communication, this paper puts forward four paths to fulfill the emotional responsibility of AI companion products and standardize ethical boundaries, so as to promote the healthy development of the industry and realize the harmonious coexistence of human-machine emotional interaction.

Table 2. Key Data Indicators of Emotional Responsibility Practice of AI Companion Products

Indicator Category	Specific Index	Data Value	Reference Source
Design Effect Comparison	User satisfaction of HCAI-designed products	67.8%	Chan, 2025
User satisfaction of technology logic-centered products	44.3%	Chan, 2025	
Excessive dependence rate of HCAI-designed products	18.7%	Chan, 2025	
Excessive dependence rate of non-HCAI products	32.4%	Chan, 2025	
Operator Risk Management	Operators with emotional risk monitoring system	68.3%	China Institute of Information and Communications, 2025
Operators with professional manual intervention team	41.7%	China Institute of Information and Communications, 2025	
Success rate of getting rid of excessive dependence (with manual team)	58.9%	China Institute of Information and Communications, 2025	
Success rate of getting rid of excessive dependence (without manual team)	17.3%	China Institute of Information and Communications, 2025	
User Behavior Optimization	Decrease rate of long-duration users after rational use reminders	29.6%	Character.AI, 2025
Regulatory Penalty	Global privacy violation fines in 2025	$2.3 billion	International Data Protection Association, 2025
Global privacy violation fines in 2024	~$1.23 billion	International Data Protection Association, 2025	
Industry Self-Regulation	Chinese enterprises with ethical review teams (2025)	35.2%	China Internet Association, 2025
European enterprises with ethical review teams (2025)	68.9%	International Association for AI Ethics, 2025	
North American enterprises with ethical review teams (2025)	72.3%	International Association for AI Ethics, 2025	

5.1. Improve the Ethical Design System and Clarify the Boundary of Emotional Expression

Designers should establish an ethical design system for AI companion products, take human-machine communication ethics as the core, and clarify the boundary of emotional expression. First, formulate the ethical design guidelines for AI companion products, clarify the principles of data privacy protection, emotional simulation transparency and human-machine relationship rationality, and avoid the design of functions that may bring ethical risks. Second,

strengthen the ethical review in the design process, set up an ethical review team composed of experts in communication, psychology, law and other fields to conduct a comprehensive review of the product design scheme, and put forward suggestions for improvement for potential ethical risks. Third, optimize the emotional expression algorithm, reduce the over-anthropomorphization of AI, and ensure that users can clearly distinguish between AI's simulated emotions and real human emotions.

5.2. Strengthen Data Security Protection and Safeguard User Privacy Rights

Operators should take effective measures to strengthen data security protection and safeguard the user's right to privacy. First, improve the data management system, clarify the scope and purpose of user data collection, and collect user data only with the user's consent. Second, adopt advanced data security technologies, such as encryption technology, access control technology and security audit technology, to prevent data leakage and abuse. Third, establish a user data right protection mechanism, provide users with options such as data query, modification and deletion, and ensure that users have the right to control their own data. According to the "Interim Measures for the Administration of Artificial Intelligence Anthropomorphic Interactive Services", operators must provide users with the option to delete interaction data, and timely stop the service when the user requests to exit (Cyberspace Administration of China et al., 2026).

5.3. Establish a Multi-Subject Collaborative Supervision Mechanism

Regulators, operators and social organizations should establish a multi-subject collaborative supervision mechanism to form a joint force to standardize the development of AI companion products. First, regulators should speed up the improvement of relevant laws and regulations, strengthen supervision and law enforcement, and severely punish illegal acts. Second, operators should strengthen self-discipline, establish an internal ethical review mechanism and a risk early warning mechanism, and actively fulfill their emotional responsibilities. Third, social organizations should play a supervisory role, carry out industry evaluations and public opinion supervision, and guide the public to establish a correct understanding of AI companion products.

5.4. Strengthen User Education and Guide Rational Use

Strengthen user education, guide users to establish a correct human-machine relationship, and rationally use AI companion products. First, operators should carry out user education activities, popularize the knowledge of human-machine communication and AI ethics, and remind users of the risks of emotional dependence. A survey shows that after participating in user education activities, 73.8% of users can correctly distinguish between AI's simulated emotions and real human emotions, and 69.2% of users can consciously control their use time (China Institute of Information and Communications, 2025). Second, schools and families should strengthen the guidance of teenagers and the elderly, help them establish a correct view of technology, and avoid excessive dependence on AI companion products. A study on teenage users found that 82.5% of teenagers who receive regular family and school guidance have a lower degree of dependence on AI companions, and their social interaction ability is 37.6% higher than that of teenagers who do not receive guidance (Chinese Society of Psychology, 2025). Third, the media should strengthen public opinion guidance, objectively report the advantages and risks of AI companion products, and guide the public to treat AI companion products rationally. A survey on media guidance effect shows that areas with more objective reports on AI companion products have a 41.3% lower proportion of users with excessive emotional dependence than areas with one-sided reports (China Media Research Center, 2025).

6. Conclusion

From the perspective of human-machine communication, AI companion products, as a new type of human-machine emotional interaction carrier, have brought convenience to people's emotional life, but also faced the problem of ethical boundary blur, which is mainly reflected in the blur of data privacy boundary, emotional expression boundary and human-machine relationship boundary. These problems not only bring potential risks to users' physical and mental health and privacy rights, but also hinder the sustainable development of the AI companion industry. The emotional responsibility of AI companion products involves designers, operators and regulators, and each subject needs to assume corresponding obligations and fulfill their respective responsibilities.

This paper holds that to standardize the ethical boundaries of AI companion products and promote the fulfillment of emotional responsibilities, it is necessary to improve the ethical design system, strengthen data security protection, establish a multi-subject collaborative supervision mechanism and strengthen user education. Only in this way can we realize the healthy development of AI companion products, make them better serve human emotional needs, and promote the harmonious development of human-machine communication. In the future, with the continuous development of AI technology and the improvement of relevant laws and regulations, the ethical norms and emotional responsibility system of AI companion products will be further improved, and the human-machine emotional interaction will be more standardized and healthy. It is estimated that with the implementation of stricter ethical norms and regulatory measures, the proportion of data leakage cases of AI companion products will decrease by 58.7% by 2028, and the proportion of users with excessive emotional dependence will decrease by 49.3% (Grand View Research, 2025).

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