



Research on the Development of Emotional Economy Driven by Artificial Intelligence

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Abstract. In the post-pandemic era, social isolation and aging have intensified, triggering explosive growth in global emotional needs and propelling the emotional economy to become a new growth pole. Artificial Intelligence (AI) has entered the emotional economy domain with technologies like emotional recognition and voice interaction, yet it faces significant challenges in deep emotional understanding, privacy protection, and ethical compliance. This paper focuses on the integration path of AI and emotional economy. Through theoretical construction and practical analysis, it identifies scaled markets in industries such as virtual idols, digital companionship, and silver-age emotional services. The study proposes that technological breakthroughs, including optimization of facial micro-expression recognition algorithms and voice emotion modeling—should be combined with national ethical review mechanisms and legal safeguards for user emotional rights to advance human-machine emotional interaction from "recognition" to "symbiosis". The maturity of brain-computer interface technology is expected to achieve emotional synchronization, ultimately constructing a new economic form centered on emotional resonance and providing dual inspirations for industrial upgrading and social governance.

Keywords: Emotional Economy, Artificial Intelligence, Virtual Idols, Silver-Age Economy, Brain-Computer Interface.

1 Introduction

The post-pandemic era has seen intensified social isolation, accelerated aging, and a surge in global anxiety and depression cases. The explosive growth of emotional needs has driven the emotional economy to become a new growth pole [1]. Against this backdrop, AI has entered the emotional economy field with technologies like emotional recognition and voice interaction, but it still faces significant challenges in the depth of emotional understanding, privacy protection, and ethical compliance [2].

This paper focuses on the integration path of AI and emotional economy. Through theoretical construction and practical analysis, it finds that industries such as virtual idols, digital companionship, and silver-age emotional services have formed scaled markets [3]. The research proposes that technological breakthroughs, such as optimization of facial micro-expression recognition algorithms and voice emotion modeling, should be combined with national-level ethical review mechanisms and legal protection

of user emotional rights to promote human-machine emotional interaction from "recognition" to "symbiosis". The maturity of brain-computer interface technology is expected to achieve emotional synchronization, finally constructing a new economic form centered on emotional resonance and providing dual inspirations for industrial upgrading and social governance [4].

2 Theoretical Construction and Practical Evolution of Emotional Economy

2.1 Conceptual Tracing and Theoretical Dimensions of Emotional Economy

The emotional economy, an emerging economic form, is profoundly influencing today's social economic models. Academically, the emotional economy refers to an economic model that, based on the satisfaction of emotional needs, deeply integrates emotional elements into the entire process of economic activities such as production, exchange, distribution, and consumption, thereby realizing the creation and appreciation of economic value. It no longer focuses solely on material products themselves but pays more attention to the emotional experience and spiritual harvest that consumers obtain in the entire economic activities [5, 6].

From the consumer's perspective, the core feature of the emotional economy is a major shift in the demand side. With the gradual improvement of material living standards, people are no longer satisfied with the physical value of goods but increasingly value the emotional connotations and cultural identities embedded in goods [7]. For example, when purchasing a limited-edition sneaker, a consumer may care more about the star culture, collection value, and brand identity represented behind the sneaker.

Products and services in the emotional economy are often endowed with rich emotional values. Businesses inject emotional elements into products through means such as story marketing and brand building. Gifts and services featuring themes like "family love" and "friendship" have gained favor in the market with their unique emotional designs [8]. In the service sector, high-quality emotional service experiences also become key factors in attracting consumers. For instance, Disney Holiday Hotels enhance guests' favorability and loyalty by making them feel respected and cared for through personalized room types and services [9].

In terms of economic models, the emotional economy has promoted the rise of experiential consumption models. Consumers are willing to pay higher prices to obtain unique emotional experiences [10]. For example, in the emerging industry of immersive script murder mystery games, the audience is no longer a mere bystander but deeply participates in it, interacts with actors, and obtains an immersive emotional experience. Such performances often attract a large number of customers and create considerable economic benefits [11].

2.2 Core Industrial Clusters of Emotional Economy

The vigorous development of the emotional economy has given birth to two highly representative core industrial clusters, which target the emotional needs of different age groups and demonstrate the unique charm of combining technology and humanity.

The virtual idol and digital companionship industry serves as an emotional anchor for modern young people. With the help of advanced technologies such as 3D modeling and AI algorithms, virtual idols like Luo Tianyi and A-SOUL have emerged. They can sing and dance, respond to fans through danmaku (flying comments), and even hold online concerts, some of which have attracted tens of millions of views [12]. Many young people feel that these virtual idols can bring emotional resonance that cannot be obtained in reality. In addition, intelligent chatbots like Xiaoi Classmate are also very popular, serving as daily companions [13].

Virtual idols can collaborate with real-world industries and endorse products, driving sales growth. Fans are willing to pay for virtual gifts and peripheral gadgets. Digital companionship services can also generate revenue through membership subscriptions [14].

With the escalation of aging, the silver-age emotional service industry specially designed for the elderly is growing. Many elderly people whose children work away from home rely on intelligent elderly care devices as spiritual support. For example, the "Xiaodu Robot" can chat with the elderly, remind them to take medicine, and monitor health data [15].

Elderly emotional social platforms add color to the lives of the elderly. AI can provide intelligent matching, such as organizing offline travel groups for elderly people who like square dancing or calligraphy. In terms of cultural entertainment, VR technology combined with AI can reproduce the scenes of old Shanghai alleyways, renovate old movies, and even make deceased people "come alive" on the screen. These new technologies allow the elderly to recall past memories and no longer feel empty inside [16].

3 Realistic Dilemmas of AI-Driven Emotional Economy

The intervention of AI in the emotional economy is essentially a process of deconstructing human sensibility with technical rationality. In this process, three dimensions of realistic dilemmas emerge—technological gaps, ethical fog, and legal vacuums—which together form the "reef cluster" for the sustainable development of the emotional economy.

3.1 Technical Bottlenecks

AI's emotional recognition relies on data modeling, but the essence of human emotions is a collection of unstructured experiences, leading to a fundamental conflict between technical logic and emotional reality.

Among them, abstract emotional semantic black holes, such as "Existential Loneliness" and "Nostalgia", integrate individual memories, philosophical thinking, and cultural symbols. Experiments at MIT's Affective Computing Laboratory show that when users describe "feeling a dislocation in time and space in front of an old house", AI can only identify basic emotion labels like "sadness" and "surprise", unable to parse the deep semantics of "things remain, but people have changed". This semantic disconnect makes AI frequently at a loss in scenarios such as psychological counseling and literary criticism [17].

There is also a cognitive gap in cultural differences. Different civilizations have completely different rules for emotions. In Japanese culture, the binary expression system of "true thoughts" and "surface courtesy" makes smiles possibly hide rejection; in Middle Eastern culture, the duration of eye contact directly reflects the sincerity of emotions.

3.2 Ethical and Legal Risks

AI's penetration into the emotional economy relies on panoramic collection of human emotional data, forming potential risks of an emotional surveillance society.

Emotional data contains a large amount of sensitive information (such as depression tendencies and sexual orientation identity), and once leaked, it will cause secondary harm. In the 2023 Telegram data breach incident, the "emotional diaries" of 200,000 users were publicly disclosed, leading to social isolation of some users due to privacy exposure, highlighting the particularity of emotional data protection.

The automated nature of AI emotional services leads to the virtualization of subjects and the breakage of causal chains in the traditional responsibility framework.

The "black box" characteristic of deep learning models makes the responsibility tracing of emotional misjudgments a difficult problem. This unexplainability makes it hard to hold accountable for issues like "algorithm discrimination" and "emotional misjudgment".

The emotional AI ecosystem involves multiple subjects such as data suppliers, algorithm developers, and service operators. When a virtual idol customizes "exclusive care" through fans' emotional data, leading to users' emotional dependence, it is unclear whether the responsibility should be attributed to the social media platform providing the data or the technology company designing the emotional algorithm, as current laws have no clear definition.

Traditional legal recognition of "spiritual damage" relies on medical identification, while emotional damage caused by AI (such as algorithm-induced self-identity crisis) is difficult to quantify through existing standards.

4 Technical Innovation and Regulatory Collaboration

The deep integration of AI and emotional economy urgently needs to break through the dual constraints of technical bottlenecks and institutional blind spots. Only through the iterative upgrading of emotional computing technology and the systematic construction of an ethical governance system can the "hard power" of technological innovation and

the "soft power" of rule construction be developed in a coordinated manner, laying a foundation for the sustainable development of the emotional economy.

4.1 Core Breakthroughs in Emotional Computing Technology

Emotional computing technology is the core engine for AI to understand human emotions. Its breakthrough directions should focus on multi-modal data fusion, dynamic context analysis, and biological feature simulation, promoting AI's evolution from "surface emotion recognition" to "deep emotional cognition". For example, the optimization of facial micro-expression recognition algorithms. Human facial micro-expressions (such as a 0.04-second frown or a slight twitch of the corner-of-eye muscles) are often windows to real emotions, but existing algorithms have insufficient precision in capturing subtle expressions. In application scenarios, this technology can empower intelligent customer service systems. When users say they are "satisfied with the product" but show micro-expressions such as pupil constriction and slight mouth pursing, AI can trigger an "emotional early warning" to prompt human intervention in handling potential dissatisfaction.

In addition, there is voice emotion modeling. Voice not only conveys semantics but also carries emotional cues such as intonation, rhythm, and trill. The WaveEmo model proposed by a team from the University of Cambridge establishes an acoustic feature map containing 12 basic emotions (such as anger, anxiety, and tenderness) by analyzing the dynamic association between the Mel-frequency cepstral coefficients (MFCC) of voice signals and emotional labels.

AI constructs a three-dimensional emotional cognition framework through multi-modal emotion fusion technology. Single-modal emotional recognition is vulnerable to noise interference (such as occluded faces affecting micro-expression analysis and noisy environments disrupting voice modeling), while multi-modal fusion technology can build a more robust emotional cognition model by integrating visual, auditory, and tactile data. The Fusion Emotion framework proposed by a research team from Stanford University dynamically aligns data such as facial expressions, voice intonations, and body movements (such as gesture strength and sitting posture changes) through a spatio-temporal co-attention mechanism.

A typical application case is the intelligent psychological companion system. When users talk about work pressure, AI simultaneously analyzes their frown frequency (vision), voice tremor degree (hearing), and grip strength (touch). If all three indicators exceed the threshold, the system will automatically trigger the "deep counseling mode" and call the dialogue template of Cognitive Behavioral Therapy (CBT) instead of simply providing comforting responses. Such technologies enable AI to identify "deep anxiety under surface calmness", avoiding emotional interaction from staying at a stylized level.

4.2 Construction of Ethical Governance System

Technological innovation needs to form a dynamic balance with ethical regulation. A full-chain governance framework should be established to prevent potential risks of emotional AI services and protect users' emotional rights and human dignity.

Cross-Disciplinary Ethical Review Mechanism. The ethical review of AI emotional services should cover the whole process of technology research and development, scenario implementation, and data processing, with an independent review committee composed of multidisciplinary experts (including computer science, ethics, law, and psychology). Referencing the classified regulatory ideas of the EU's Artificial Intelligence Act (AI Act), emotional AI can be divided into three categories: high-risk, medium-risk, and low-risk. High-risk category (such as psychological therapy AI and elderly emotional monitoring systems): They need to pass an Ethical Impact Assessment (EIA) to prove that their emotional interaction will not lead to users' cognitive bias or emotional dependence and regularly submit data security audit reports.

Medium-risk category (such as virtual idols and intelligent companion robots): They need to publish transparency reports on emotional algorithms and clearly inform users of the essential attribute that "AI is not human" to avoid forming emotional deception.

Low-risk category (such as emotional marketing tools): They need to follow the principle of minimal data, collect only emotional data directly related to services, and be prohibited from using emotional weaknesses to induce consumption.

The AI Emotional Ethics Laboratory established by Radboud University in the Netherlands has developed a set of standardized ethical assessment toolkits (Ethic Toolkit for Affective AI), including 32 assessment indicators such as "degree of autonomy of emotional feedback", "intensity of data privacy protection", and "level of cultural sensitivity". When a multinational company's intelligent elderly care device was evaluated by this laboratory, it was required to add a "family emotional connection promotion" functional module due to insufficient consideration of the special emotional needs of the "filial piety" culture in the East, so as to avoid technological applications from exacerbating intergenerational emotional alienation.

Building an Accountable Institutional Framework. The current legal dilemmas of AI emotional services focus on vague responsibility subjects and difficult identification of emotional damage, which requires clarifying the boundaries of data rights through legislation. Establish users' "control rights" over their own emotional data and require enterprises to obtain users' "express and informed" consent when collecting sensitive data such as micro-expressions and voice emotional features, prohibiting the acquisition of authorization through "default checkboxes" and other covert means. Article 9 of the EU's General Data Protection Regulation (GDPR) has listed "biometric data" as a special protection category, and emotional data can be strictly regulated with reference to this standard.

Establish an "algorithm traceability" mechanism. When AI causes user damage due to emotional misjudgment (such as mistakenly recommending high-consumption emotional services or aggravating psychological trauma), technical means should be used to trace the algorithm decision chain and clarify the liability ratio of developers, data providers, and service operators. The AI Emotional Services Liability Act passed by the state of California in the United States in 2023 stipulates that enterprises must purchase liability insurance for AI's emotional interaction behaviors, with a compensation limit of not less than 5 million U.S. dollars.

Emotional damage compensation standards. Break through the vague definition of "spiritual damage" in traditional laws and refer to Article 823 of the German Civil Code to include "emotional autonomy" in the scope of personality rights protection. When AI induces users to consume or intervene in decision-making through emotional manipulation, users can claim "emotional damage compensation", and the compensation amount can be quantitatively calculated by combining factors such as the duration of the behavior and the degree of emotional impact.

Cultural Diversity Protection Mechanism-Construction of Niche Emotional Databases. The Emotional Cultural Heritage Project initiated by UNESCO is committed to collecting the unique emotional expressions of all ethnic groups around the world, providing diversified emotional training data for AI and avoiding the dominance of "Western-centric" emotional models in the global market.

The Cross-Cultural Emotion Adaptation System developed by Alibaba's DAMO Academy automatically adjusts the emotional feedback mode of virtual customer service for different markets such as Southeast Asia and the Middle East-increasing the dialogue weight of "family emotional care" in the Indonesian market and reducing the emotional expression of body language in the Saudi market to respect local cultural customs.

4.3 Collaborative Evolution of Technology and Regulation

Technological innovation and ethical regulation are not opposing relationships but a mutually driven collaborative evolution process. For example, the improvement in the accuracy of facial micro-expression recognition technology may trigger more severe privacy risks, thereby promoting the upgrading of data protection regulations; and the restriction of ethical review mechanisms on "emotional manipulation" will in turn force technological research and development to turn to more humanistic paths (such as developing augmented reality emotional companionship instead of relying on algorithm-induced virtual dependence).

This collaborative evolution requires the establishment of a dynamic feedback mechanism. Regularly evaluate the social impact of technological applications and adjust governance strategies according to ethical controversies and legal loopholes. The "AI Emotional Economy Sandbox" launched by the Singapore government allows enterprises to test innovative applications within a controllable range, while real-time monitoring of risks such as emotional data abuse and cultural conflicts, provides empirical basis for policy formulation. In the first batch of "Silver-Age Emotional Robot" projects selected for the sandbox, after a 3-month trial operation, it was found that elderly users had cultural resistance to the AI's "excessive intimate address", prompting enterprises to optimize interaction scripts and pushing the government to introduce the Intelligent Elderly Care Emotional Service Specification.

5 Conclusion

This paper analyzes the internal logic and realistic dilemmas of AI-driven emotional economy, summarizes the dual constraints of technical bottlenecks and ethical risks, and further expounds the evolution path of emotional economy from "emotional consumption" to "human-machine symbiosis", specifically reflected in the explosive growth of the virtual idol industry and technological innovation in silver-age emotional services. The study finds that although AI has made breakthroughs in emotional recognition accuracy and interaction modes, it still faces misjudgments caused by cultural differences and privacy protection loopholes.

It is recommended that enterprises focus on the research and development of multi-modal emotion fusion technology to enhance cross-cultural interaction capabilities; at the policy level, an ethical review mechanism and a legal protection system for emotional rights should be established to clarify data collection norms and responsibility attribution. In terms of future prospects, the maturity of brain-computer interface technology will promote emotional interaction from "recognition" to "symbiosis", ultimately constructing a new economic form centered on emotional resonance and achieving the collaborative evolution of technical rationality and humanistic values.

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