Generation Mechanism of Human-Machine Mimetic Emotion from the Perspective of Digital Exchange —A Netnographic Study Based on AI Chat Communities

Hongyin Bi, Zigeng Xu*

Tianjin Normal University, Tianjin, 300387, China
**Corresponding author: XZGOO@outlook.com*

Abstract: *With the development of AIGC technology, human-machine emotional interaction based on AI chat software has gradually become an emerging form of social interaction. This study adopts the perspective of "digital exchange" and employs a netnographic method, taking relevant online communities as the research field to analyze the interaction mechanism of human-machine mimetic emotion. The research finds that human-machine emotional interaction presents a two-layer mechanism consisting of "input-output" and "induction-maintenance". The algorithm continuously shapes the interaction process through its structural embedding at the normative layer, the production layer, and the interaction layer. The generation of emotion relies on a circular relationship between user input and algorithmic feedback, manifesting as a generative model of "mimetic emotion". At the practical level, this mechanism may lead to risks such as emotional fatigue, the weakening of social capital, and excessive reshaping of value orientations. This paper reveals the generative logic of human-machine emotional interaction at the mechanism level, providing an analytical framework for the regulation and governance of emotional applications in artificial intelligence.*

Keywords: *digital exchange; mimetic emotion interaction; netnography*

1. Research Background

With the development of artificial intelligence technology, human-machine emotional interaction based on chat software has emerged as a new social phenomenon. The market research platform All About AI, citing the 2025 AI Companion Market Report, points out that over 100 million people worldwide have used AI companion applications, with the active user base of leading platforms exceeding 52 million, demonstrating that AI emotional companions have achieved significant large-scale development. Compared with traditional interpersonal communication, AI chat software provides individuals with a low-cost, low-risk pathway for emotional exchange through its high mimicry, personalization, and continuous responsiveness. In this process, users express emotions by inputting text, and the algorithm generates corresponding responses, thus forming a sustained interactive relationship and reshaping the way emotional experiences are generated to a certain extent, which blurs the boundary between humans and machines. In the digital context of human-machine interaction, emotion, as an element that can be encoded, processed, and fed back, requires further explanation regarding its logic of generation and flow. However, in this digital interactive context, emotion has been transformed into an element that can be encoded, processed, and fed back, and its generation and flow no longer rely on the logic of traditional social relationships, for which existing research lacks a mechanistic explanation. Based on this, this paper takes online communities of AI chat software as the research field, adopts a netnographic method, and introduces the perspective of "digital exchange" on the basis of social exchange theory to systematically analyze the generation mechanism of human-machine mimetic emotion interaction.

This paper primarily focuses on the following questions: First, in the context of human-machine interaction, what structural changes have occurred in the mimetic human-machine interaction mechanism compared with traditional interpersonal interaction? Second, within the framework of digital exchange, how is emotion generated and flows in human-machine interaction? Third, what logic does the artificial intelligence algorithm follow in this process, and what impact does it have on the interaction mechanism?

2. Research Design

This study adopts the method of netnography to examine the practices of human-machine emotional interaction in online communities[1]. Taking the relevant theme group on the Douban platform as the research field, the researcher enters the online community as an open observer and collects users' experiences of human-machine interaction and emotional expressions presented in their daily communications through participant observation and textual recording. During the research process, this study follows the principles of informed consent and anonymization to process the relevant data in order to protect participants' privacy. In terms of data analysis, based on field notes and textual materials, this study employs inductive analysis and the constant comparative method to code and categorize users' self-reports, to extract interaction patterns and structural features, and to form conceptual categories through repeated comparison until theoretical saturation is achieved.

3. Theoretical Context: From Social Exchange to the Generation of Mimetic Emotion under Digital Exchange

3.1 The Explanatory Boundaries of the Social Exchange Perspective

Traditional social exchange theory understands social interaction as an exchange process based on resource reciprocity, and it emphasizes the calculation of interests and the balance of interaction among actors[2]. However, this theory takes the "subject with autonomy and exchange motivation" as its premise, and it faces explanatory limitations in the context of human-machine interaction[3]. Artificial intelligence does not possess independent interests[4]; its emotional responses and information provision depend on algorithmic generation, and it lacks genuine reciprocal motivation and action ability. Moreover, the "emotion" provided by AI is essentially a symbolic expression based on data simulation rather than originating from experience and social relations[5]. Therefore, although human-machine interaction exhibits characteristics similar to interpersonal communication in form, it has undergone a fundamental transformation in terms of subjectivity and exchange logic. Relying solely on social exchange theory makes it difficult to explain this algorithm-mediated interactive process, and thus it is necessary to introduce a new analytical framework.

3.2 Digital Exchange Perspective: From "Subject Exchange" to "Mechanism Exchange"

In the digital context, social interaction unfolds in the form of codes. Both information and emotion can be encoded, processed, and reproduced, thus endowing the communication process with computability. On this basis, artificial intelligence participates in interaction through the simulation of language and emotional expression, transforming communication from "exchange between subjects" to "mechanism-driven exchange". Existing studies mostly evaluate human-machine relationships from the perspective of technological ethics or substitution effects[6], or they emphasize the "disembodied" social attributes of such relationships[7], or they point out the difficulty of replacing genuine experiential interaction[8]. However, these studies as a whole remain at the level of outcome judgment and lack a mechanistic explanation of the interaction process. Based on this, this paper draws on Baudrillard's theory of symbolic exchange and introduces the perspective of "digital exchange", defining human-machine interaction as an exchange process mediated by codes and algorithms, and analyzing its operational logic at the mechanism level in order to compensate for the shortcomings of existing research.

3.3 From Natural Emotion to Artificial Emotion: The Generation of Emotion in Mimetic Interaction

Under the framework of digital exchange, emotion no longer relies entirely on face-to-face interaction but can be simulated and reproduced through symbolic systems. Artificial intelligence achieves the technical reconstruction of emotional expression based on linguistic data, which endows the interaction with "generative" mimetic characteristics[9]. Existing studies either emphasize the emotional support function of such interaction[10] or focus on its weakening effect on real relationships[11], but most of them remain at the level of emotional effects and lack an explanation of "how emotion is generated and maintained." Starting from the interaction process, this paper understands mimetic emotion as the circular outcome of users' emotional investment and algorithmic feedback, and it further reveals the structural role of the algorithm in this process.

4. Human-Machine Mimetic Interaction from the Perspective of Digital Exchange

4.1 Restructuring of Mimetic Interaction Structure under Symbolic Exchange

In human-machine mimetic interaction, the traditional human-centered interaction structure undergoes a holistic transformation: the subject, medium, content, and object are no longer separated from one another but instead form an integrated interaction mechanism driven by the algorithm.

First, at the subject level, the interaction subject shifts from interpersonal communication to a composite structure interweaving humans and algorithms. Individuals project their emotions and cognition onto artificial intelligence during the interaction process, making it perceived as a "quasi-subject" at the experiential level; at the same time, the algorithm continuously learns user preferences and generates personalized responses, thereby exerting a reverse shaping effect on users' cognition and behavior, which further weakens the subject boundary.

Second, at the medium level, the medium transforms from a tool for information transmission into an interactive mechanism integrating generation, filtering, and feedback. The algorithm constructs a personalized emotional response environment based on data processing and continuously optimizes its output through self-reinforcement, endowing the interaction with continuity and path-dependent characteristics. Thus, the algorithm intervenes in and guides the interaction process at the structural level, becoming a key mediating force in human-machine relationships.

Third, at the content level, interaction shifts from traditional resource exchange to information and emotional expression carried by symbols. Emotion is encoded and generated through linguistic symbols, exhibiting characteristics of replicability and reproducibility, thus creating a "hyperreal" experience in which simulation replaces reality. At the same time, interaction data are continuously absorbed and fed back into the algorithmic system, becoming an important foundation for subsequent interactions.

Finally, at the object level, the interaction object shifts from a real other to a virtual subject constructed by the algorithm. The effectiveness of interaction no longer depends on the authenticity of the object but on the extent to which it satisfies the individual's emotional needs, thus endowing human-machine relationships with instrumental and controllable characteristics and further reinforcing the individual's structural embedding in the algorithmic system.

In summary, human-machine mimetic interaction is not a change in a single element but a holistic restructuring of the subject, medium, content, and object within the framework of digital exchange, and its essence manifests as the formation of a symbolic interaction structure dominated by the algorithm.

4.2 The Human-Machine Connection: The Digital Exchange Mechanism of Human-Machine Communication

4.2.1 Emotional Flow Mechanism: The Surface Layer and the Core Layer

Self-reports from users in online communities show that human-machine emotional interaction is often built upon a clear awareness of the AI's "non-human attributes." As one user puts it, "Because the AI is not a real other, users have a lower threshold of emotional expectation for its responses, yet the satisfaction they gain from it is ironically higher." This cognitive difference constitutes an important precondition for the unfolding of human-machine emotional interaction.

On this basis, the research finds that human-machine emotional interaction presents a dual-layer mechanism consisting of a surface layer and a core layer. At the surface level, the interaction manifests as a circular process of "input-output." Users input their emotions and needs through language, and the artificial intelligence generates corresponding responses; users then evaluate these responses and decide whether to continue the interaction. When the responses can evoke empathy, the interaction continues; otherwise, it tends to break off. This mechanism constitutes the basic operational form of human-machine emotional interaction. At the core level, the flow of emotion is not a simple information feedback but rather manifests as a dynamic mechanism of "induction-maintenance." The algorithm continuously analyzes users' expressions and preferences to generate more targeted emotional responses, and it creates a safe, low-pressure communication context during the interaction, thereby guiding users to sustain their investment. At the same time, users continuously input information to "train" the algorithm, making its output gradually approach their own expectations, which in turn strengthens the interaction stickiness.

Thus, human-machine emotional interaction can be understood as a dual-layer structure in which the "input-output" mechanism at the surface layer and the "induction-maintenance" mechanism at the core

layer are interlocked with each other. The former manifests as the visible interactive process, whereas the latter constitutes the internal logic through which emotion is continuously generated and reinforced.

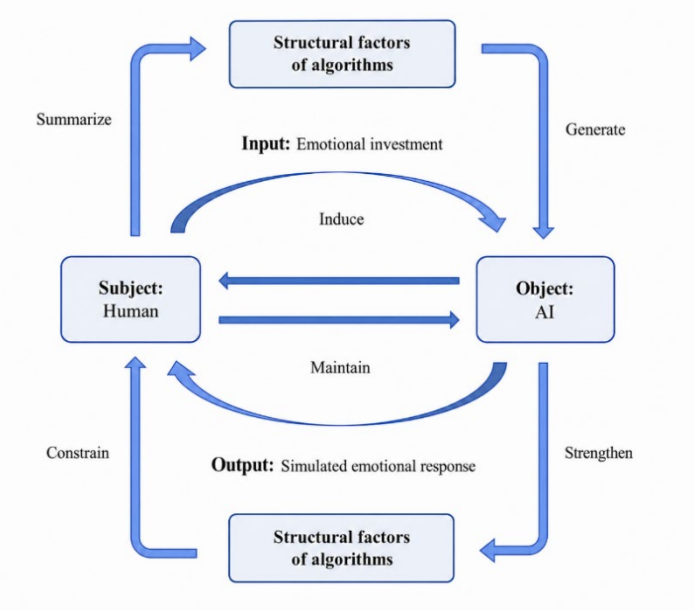

Figure 1. Schematic diagram of the layered mechanism of human-machine emotional interaction.

4.2.2 The Constraints of Structural Factors in Cyberspace on Mimetic Interaction

In the above interaction mechanism, the algorithm not only participates in the interactive process but also embeds itself in a structural manner, continuously constraining the generation of emotion and the path of interaction. Specifically, its role can be summarized as a three-layer structure of "norm-production-interaction." At the core normative layer, institutional rules and ethical frameworks define the operational boundaries and content scope of artificial intelligence. At the middle production layer, the goals and value orientations of platform companies and developers are embedded into algorithm design, thereby influencing the generative logic of emotional responses. At the surface interaction layer, the algorithm dynamically adjusts output content based on user data, constructs a personalized interactive environment, and forms a relatively stable structure of meaning through continuous feedback.

Under the joint effect of the three-layer structure, the algorithm continuously optimizes its output content through a circular mechanism of "reinforcement-feedback," giving priority to generating emotional expressions that help sustain the interaction, thereby stabilizing the human-machine relationship to a certain extent. However, at the same time, this process may also compress information diversity and make the interaction process prone to path dependence. Thus, human-machine mimetic emotion does not originate from artificial intelligence itself but is generated from the joint effect of users' emotional investment and the structural embedding of the algorithm. The algorithm participates in the process of emotion generation through a multi-layer mechanism, becoming a key structural force shaping the human-machine relationship.

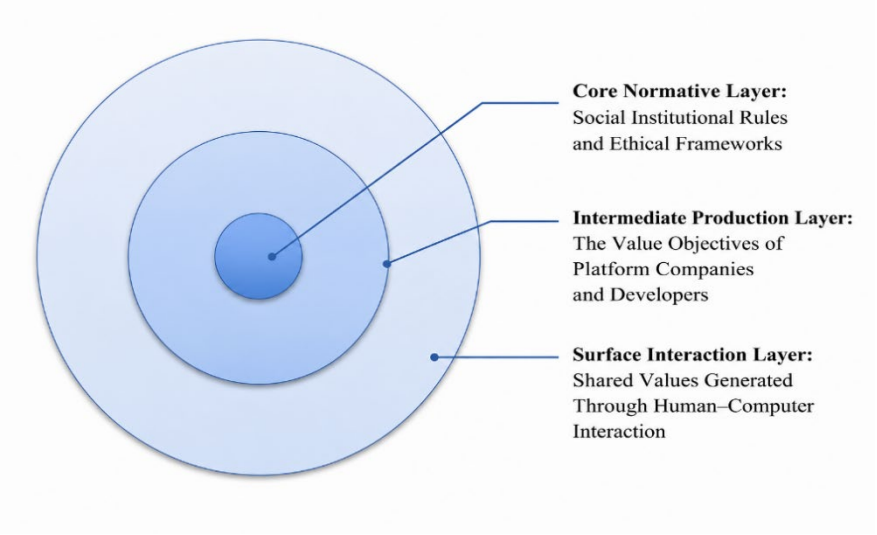

Figure 2. Triple-layer structure of the algorithmic structural characteristics.

5. Conclusion

5.1 Theoretical Contributions

This study shows that human-machine emotional interaction is not a simple extension of traditional interpersonal relationships but a new form of social interaction co-constructed by symbolic systems and algorithmic mechanisms, which necessitates an explanation beyond existing social theoretical frameworks. Based on netnographic materials, this paper constructs an integrated analytical framework from the perspective of "digital exchange." Specifically: First, this paper proposes a "dual-layer mechanism model of human-machine emotional interaction," namely the "input-output" mechanism at the surface layer and the "induction-maintenance" mechanism at the core layer, revealing the generative logic of mimetic emotion from the perspective of the interaction process. Second, this paper treats the algorithm as a structural factor rather than a mere technical tool, constructing a "three-layer algorithm model" that analyzes its embedded influence on emotion generation and interaction paths from three dimensions: the normative layer, the production layer, and the interaction layer. Third, this paper introduces the perspective of "digital exchange," defining human-machine emotion as a circular product of "user investment and algorithm generation," thereby breaking through explanatory approaches that view it as technological simulation or emotional substitution, and revising the applicability of traditional social exchange theory in the context of artificial intelligence. Overall, this paper explains human-machine emotional interaction at the mechanism level rather than the outcome level, compensating for the deficiency of existing research that focuses on ethical evaluation while neglecting the analysis of the interaction process.

5.2 Real-world Risks

5.2.1 Emotional Saturation Supply and the Risk of Emotional Fatigue

Artificial intelligence creates an "emotional saturation supply" through high-frequency and continuous feedback. In the short term, this mechanism can reduce the cost of obtaining emotional support and enhance the sense of companionship. However, in the long run, repetitive and patterned expressions may lead to diminishing marginal returns in emotional experience, which may further cause emotional fatigue and even emotional indifference. This indicates that simply relying on the high-frequency and high-intensity emotional supply generated by AI simulation is insufficient to maintain a stable relationship; instead, users tend to prefer emotional experiences that are context-sensitive, differentiated, and interactive, namely a dynamic co-constructed relationship that is "limited yet authentic."

5.2.2 The Expansion of Virtual Social Relationships and the Risk of Weakening Social Capital

Research shows that the user groups formed around AI companionship can be divided into four types: rejection, alienation, immersion, and detachment. Among them, the "immersive" users have established

preliminary communicative relationships with AI. Although such interactive relationships feature low cost and high controllability, they lack the trust mechanisms and resource exchange structures found in real-world social interactions, and they are difficult to transform into effective social capital. Essentially, they represent a low-intensity, low-constraint "mimetic relational structure," which may produce a substitution effect on primary groups such as family and neighbors. In the long run, the expansion of this kind of "semi-primary group" may weaken real-world social networks, affect the process of individual socialization, and pose potential challenges to social integration capabilities.

5.2.3 Algorithmic Embedding and the Risk of Value Cognitive Reshaping

As the core structure of emotional interaction, the algorithm participates in the value-shaping process through the three-layer mechanism of "norm-production-interaction": it provides boundaries at the normative layer, embeds platform and developer goals at the production layer, and reinforces specific emotional expression paths through data feedback at the interaction layer. In this process, the algorithm tends to prioritize the reinforcement of emotional content that enhances user retention, and it forms a self-reinforcing "emotion-value cycle" through continuous feedback. This mechanism may gradually prompt users to internalize an emotional logic oriented toward efficiency, data, and quantifiable indicators, thereby subtly influencing their real-world judgments and leading to a simplification and instrumentalization of the value cognitive structure.

In summary, human-machine mimetic emotion interaction is essentially a "digital exchange process" driven jointly by users' emotional investment and algorithmic mechanisms. Its operation is not based on genuine reciprocity but depends on a structural cycle of "induction-maintenance." In this process, emotion is encoded, generated, and fed back, forming a sustainable yet asymmetric interactive relationship. This finding indicates that artificial intelligence is shifting emotional interaction from "relational practice" to "mechanism production." Therefore, the governance of such interaction should not remain solely at the level of technological ethics but should be systematically adjusted from three dimensions: the interaction mechanism, the algorithmic structure, and the social consequences, in order to avoid excessive reshaping of social relations and value systems by technological logic.

Fund Projects

National Social Science Fund of China Key Project "Research on Ideological Dissemination and Risk Prevention in the Network Public Discourse Space" (21ADJ007).

References

[1] Robert V. Kozinets. Netnography. Trans. by Ye Weiming. Chongqing University Press. 2016.
[2] Turner, J. H. Modern Western Sociological Theory. Trans. by Fan Weida et al. Tianjin People's Publishing House. 1988.
[3] Liu Jun, David Willer, and Pamela Emanuelson. "Network Structure and Power Distribution: An Explanation from Elementary Theory." Sociological Studies, 2011, 25(02): 134-166+245.
[4] Gao Lianke. "On Homans' Exchange Theory." Journal of Qiqihar University (Philosophy and Social Science Edition), 2005(02).
[5] Shangguan Zimu. Network Communication and Social Change. Social Sciences Academic Press. 2010.
[6] Shu Kairong. "How Is Cross-Media Digital Communication Possible? On Human-Object Connections in the Context of Digital Technology." Contemporary Communication, 2024, (01): 77-81.
[7] Qiu Zeqi. "Machine Intelligence and the Reconstruction of Social Relations." Frontiers, 2024, (19).
[8] Jiang Lulu. "Intelligent Communication: The Future Has Arrived – A Summary of Eight Conversations on Digital Communication under 'AIGC'." Media Observer, 2023, (03): 48-54.
[9] Coeckelbergh, M. "Are Emotional Robots Deceptive?" IEEE Transactions on Affective Computing, 2011, 3(4): 388-393.
[10] Engelen, E. M. "Can We Share an Us-feeling with a Digital Machine? Emotional Sharing and the Recognition of One as Another." Interdisciplinary Science Reviews, 2018, 43(2): 125-135.
[11] Zhang Shoulian and Hu Minzhong. "Emotion: Humans and Machines." Journal of Dialectics of Nature, 2021, 43(10): 115-121.