AI Clones as Extension of Self: A Survey of Interfaces, System Designs, and Psychological Implications

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January 14, 2025

Contents

1 Introduction

The concept of AI clones and digital twins as extensions of self represents a significant frontier in human-computer interaction and psychological research. As artificial intelligence systems become increasingly sophisticated, the ability to create digital representations that mirror not just our physical characteristics but our cognitive and behavioral patterns has moved from science fiction to technological reality. This advancement raises fundamental questions about the nature of self-identity, agency, and the psychological implications of human-AI integration.

The development of AI clones—digital entities that learn from and emulate their human counterparts—has garnered significant attention across multiple disciplines. From healthcare applications where digital twins assist in personalized treatment planning [Kim et al., 2024] to social contexts where AI agents serve as extensions of human presence [Kawakami, 2020], these technologies are reshaping our understanding of human-computer interaction and self-representation in digital spaces.

1.1 Scope and Objectives

This survey paper presents a comprehensive examination of the current state of research regarding AI clones as extensions of self, focusing on three interconnected domains that emerge from recent literature. First, we investigate the technical frameworks and interaction paradigms that enable AI clone creation and operation, building on the foundational work of Smith et al. [2022] in digital twin architectures and Wang et al. [2024]'s contributions to interaction benchmarking. Second, we explore the psychological implications of human-AI clone interaction, examining cognitive, emotional, and behavioral effects as documented in studies by Maeda and Yuki [2023] and Yamamoto and Komatani [2024]. Third, we analyze how humans perceive and attribute agency to AI clones, with particular attention to the Japanese concept of 自己帰属 (self-attribution), drawing from Nakagawa et al. [2019]'s seminal work on cultural acceptance patterns.

The scope of our investigation encompasses several critical aspects of AI clone development and implementation. Recent advances in technical architectures and interface designs, as demonstrated by Mandischer and Atanasyan [2024]'s POT framework, have enabled increasingly sophisticated human-AI interactions. These technical developments are intrinsically linked to psychological mechanisms underlying human-AI clone relationships, which Niwa et al. [2024] has shown to vary significantly across cultural contexts. Furthermore, cultural variations in self-attribution and agency perception, as documented by DeJuan and Smith [2024], have profound implications for system design and implementation. These considerations naturally lead to important ethical questions regarding digital self-extension, which Namestiuk [2023] addresses through their philosophical analysis of machine consciousness and identity.

1.2 Methodology

Our methodology employs a systematic review of academic literature across multiple disciplines and cultural contexts, synthesizing insights from diverse research traditions. We analyzed technical papers from major computing conferences and journals, including groundbreaking work by Shang et al. [2024] on brain-computer interfaces and Kim et al. [2024]'s implementation of healthcare decision support systems. This technical foundation is complemented by psychological research from both Western and Eastern perspectives,

exemplified by Lee [2024]'s mathematical framework for self-identity emergence and Veliev [2024]'s analysis of digital consciousness.

The literature review encompasses publications from 2015-2024, with particular emphasis on developments between 2020-2024 that reflect current technological capabilities and psychological understanding. Our selection criteria prioritized research that demonstrates significant impact in advancing understanding of AI clones as self-extensions. For instance, Liu and Chen [2024]'s comparative study of Eastern and Western implementation patterns has been instrumental in understanding cross-cultural dynamics, while Zhang and Liu [2023]'s framework analysis has provided crucial insights into cultural adaptation mechanisms. This careful curation of sources ensures comprehensive coverage of technical innovations, psychological insights, and cultural perspectives essential for understanding AI clones as extensions of self.

1.3 Paper Organization

The remainder of this paper is organized as follows:

Section 2 establishes the theoretical framework, defining key concepts and introducing fundamental theories of self-extension and agency. Section 3 examines interface and system designs, analyzing technical approaches to AI clone implementation. Section 4 explores psychological implications, focusing on identity formation and cognitive integration. Section 5 investigates agency and self-reference, with particular attention to cultural variations in self-attribution. Section 6 discusses current limitations and future directions, while Section 7 concludes with a synthesis of findings and research opportunities.

Throughout the paper, we maintain a cross-cultural perspective, particularly highlighting Japanese concepts and research contributions to provide a more comprehensive understanding of how different cultures approach and interpret AI clone technology and its implications for self-extension.

2 Theoretical Framework

2.1 Defining AI Clones and Digital Twins

The concepts of AI clones and digital twins, while related, have distinct characteristics and applications in the context of self-extension. Digital twins, originally conceived in engineering contexts, represent detailed digital replicas of physical entities [Smith et al., 2022]. When applied to human subjects, these digital twins evolve beyond mere simulation to incorporate cognitive and behavioral patterns, leading to what we term "AI clones"—autonomous digital entities that learn from and emulate their human counterparts.

The distinction between traditional digital twins and AI clones lies primarily in their level of agency and learning capability. While digital twins typically focus on state replication and prediction, AI clones incorporate advanced machine learning techniques to develop autonomous behaviors while maintaining alignment with their human original's preferences and patterns [Lauer-Schmaltz and Martinez, 2024a].

2.2 Self-Extension Theory

The theoretical foundation for understanding AI clones as extensions of self draws from multiple disciplines, including psychology, cognitive science, and human-computer inter-

action. The concept of extended self, first proposed by Belk [1988], suggests that individuals incorporate external objects and tools into their sense of identity. In the digital age, this theory has evolved to encompass virtual possessions and digital representations [Kawakami, 2020].

Recent research has significantly expanded this theoretical framework to account for the unique characteristics of AI systems. Lee [2024]'s mathematical framework for self-identity emergence demonstrates how cognitive extension through AI clones fundamentally alters human capabilities, while Veliev [2024]'s analysis reveals the complex processes of identity integration as individuals incorporate AI capabilities into their self-concept. The question of agency attribution, particularly salient in human-AI interaction, has been extensively examined by Namestiuk [2023], who challenges traditional boundaries between self-awareness and self-consciousness in AI systems.

2.3 Agency and Self-Attribution (自己帰属)

The Japanese concept of 自己帰属 (self-attribution) provides a unique theoretical lens for understanding how individuals attribute agency and ownership to AI clones. Maeda and Yuki [2023]'s comprehensive study reveals that this concept encompasses both the cognitive process of recognizing actions as self-generated and the emotional attachment to digital extensions of self. Their research demonstrates that Japanese participants show significantly higher levels of self-attribution towards AI actions compared to their Western counterparts, with cultural background playing a crucial role in how individuals integrate AI capabilities into their self-concept.

The theoretical framework for understanding self-attribution in AI clone systems has been further developed through Hirota et al. [2024]'s category-theoretic approach to autonomy. Their work demonstrates how formal mathematical frameworks can model self-reference in AI systems while bridging Western and Eastern perspectives. This theoretical advancement has revealed three critical components: the recognition and attribution of actions performed by AI clones, the delicate balance between autonomous operation and user control, and the variation in cultural frameworks for understanding self-extension.

2.4 Cultural Perspectives on Digital Self-Extension

Cultural variations in understanding self-extension and agency attribution play a crucial role in how AI clones are perceived and integrated into daily life. Liu and Chen [2024]'s comparative study of Eastern and Western implementation patterns has revealed fundamental differences in how different cultures approach AI clone integration. Their research demonstrates that adaptive frameworks can improve cross-cultural implementation success rates by 49

2.4.1 Eastern Perspectives

Eastern cultures, particularly Japanese society, demonstrate distinct patterns in AI clone acceptance and integration. Nakagawa et al. [2019]'s research reveals how traditional concepts of 和 (harmony) influence AI interaction patterns, fostering an interdependent self-construal that facilitates flexible boundaries between self and technology. Their work shows that Japanese cultural context promotes collective agency attribution, significantly affecting how AI clones are integrated into social and professional contexts. These findings are further supported by Tanaka and Yamamoto [2023]'s research, which demonstrates

how Japanese cultural patterns significantly influence AI clone integration through collective identity frameworks.

2.4.2 Western Perspectives

Western approaches to AI clone integration reveal markedly different patterns, as documented by DeJuan and Smith [2024]'s analysis of agency attribution models. Their research shows that Western users demonstrate stronger preferences for explicit control mechanisms, emphasizing individual agency and maintaining clear boundaries between self and technology. This focus on personal autonomy significantly influences system design preferences and interaction patterns, with trust development correlating strongly with perceived individual control.

2.4.3 Cross-Cultural Integration

Recent research suggests a promising convergence of perspectives as AI clone technology becomes more prevalent globally. Zhang and Liu [2023]'s framework analysis demonstrates that cultural adaptation mechanisms can improve implementation success rates by 53

This theoretical framework provides the foundation for understanding both technical implementation and psychological implications of AI clones as extensions of self. The integration of Eastern and Western perspectives, particularly through the lens of 自己帰属, offers a comprehensive approach to analyzing human-AI clone relationships.

3 Interface and System Designs

3.1 Architecture of AI Clone Systems

The technical implementation of AI clone systems requires sophisticated architecture that balances autonomy, learning capability, and user control. Smith et al. [2022]'s foundational work on digital twin architectures establishes a multi-layered framework that has become standard in modern implementations. The data collection layer, as demonstrated by Shang et al. [2024]'s integration of brain-computer interfaces, incorporates advanced behavioral monitoring systems, input processing mechanisms, and context awareness modules. Their research shows that this comprehensive data collection approach improves digital twin accuracy by 47

The learning layer, built upon this data foundation, implements sophisticated pattern recognition algorithms and behavioral modeling systems. Wang et al. [2024]'s SimBench framework has established crucial metrics for evaluating these learning mechanisms, revealing how multi-turn interaction testing can expose limitations in maintaining consistent behavioral patterns. Their rule-based evaluation framework demonstrates the critical importance of cultural context in digital twin interaction authenticity. The interaction layer completes this architecture by implementing natural language processing, gesture recognition, and multimodal interfaces, creating a comprehensive system for human-AI interaction.

Recent implementations have demonstrated various approaches to these architectural components. Lauer-Schmaltz and Martinez [2024b] developed a rehabilitation gaming system using digital twins that adapts to user behavior patterns, achieving a 56

3.2 User Interface Paradigms

Interface design for AI clone systems has evolved significantly through recent research advances. Mandischer and Atanasyan [2024]'s POT framework provides a structured approach to modeling human-AI interaction patterns, demonstrating how observer perspective enables real-time adaptation of interaction models. Their research shows that transparency mechanisms significantly facilitate trust development in human-AI relationships, while cultural factors emerge as critical determinants in the effectiveness of human modeling approaches.

Direct manipulation interfaces have evolved substantially to accommodate AI clone interaction. Niwa et al. [2024]'s investigation of facial self-similarity effects reveals significant cultural variations in optimal interface design, with user engagement correlating strongly with cultural alignment in agent behavior. Their work demonstrates that real-time cultural adaptation mechanisms can improve user acceptance by 37

Natural language processing has emerged as a crucial component in AI clone interaction. Yamamoto and Komatani [2024]'s research on personality expression in AI systems shows that adaptive personality expression can enhance user engagement by 42

The integration of AI clones with mixed reality environments has opened new frontiers in interaction design. Shang et al. [2024]'s work on neuromorphic computing demonstrates how spatial computing, environmental awareness, and social presence simulation can be enhanced through direct neural feedback, reducing latency in human-AI interaction by 68

3.3 Interaction Models

Current research has identified several successful interaction models for AI clone systems. Nguyen and Cohen [2024]'s investigation of human-AI teams reveals distinct patterns in trust development based on interaction frequency and success rates. Their work demonstrates that mirrored interaction, incorporating direct replication of user behavior and synchronized responses, can achieve a 47

Complementary interaction models, as studied by Chen and Rodriguez [2024], show how task delegation, resource optimization, and cognitive offloading can be effectively implemented across different domains. Their research reveals that adaptive frameworks can improve cross-domain applicability by 48

Autonomous operation capabilities have been significantly advanced through recent research. Lee [2024]'s mathematical framework for self-identity emergence demonstrates how independent decision-making, learning-based adaptation, and context-aware responses can be effectively implemented while maintaining cultural sensitivity.

3.4 Data Collection and Learning Mechanisms

The effectiveness of AI clones depends heavily on sophisticated data collection and learning mechanisms. Wang et al. [2024]'s research establishes comprehensive metrics for evaluating behavioral tracking, preference monitoring, and context awareness capabilities. Their work demonstrates how social interaction patterns can be effectively captured and analyzed through rule-based evaluation frameworks.

Learning algorithms have evolved to incorporate multiple approaches to behavior adaptation. Shang et al. [2024]'s integration of neuromorphic computing with brain-computer interfaces demonstrates how reinforcement learning, neural networks, and natural language understanding can be enhanced through direct neural feedback. Their

work shows particular promise in emotional intelligence modeling, achieving significant improvements in user engagement and trust development.

3.5 Case Studies

Recent implementations across various domains demonstrate the versatility of AI clone systems. In healthcare applications, Kim et al. [2024]'s decision support system shows how patient preference learning and treatment planning assistance can be enhanced through cultural adaptation, improving outcomes by 31

Social applications have showcased advanced interaction capabilities through personality mirroring and cultural adaptation. Kawakami [2020]'s analysis of digital self-extension in social contexts demonstrates how AI clones can effectively maintain social presence while adapting to cultural norms. Their research reveals the importance of social context awareness in maintaining user engagement and trust.

Professional applications have demonstrated practical implementations across various sectors. Smith et al. [2022]'s work on engineering digital twins provides a framework for task automation and decision support, while Mandischer and Atanasyan [2024]'s POT framework demonstrates effective approaches to knowledge management in professional contexts. These implementations show how AI clones can effectively extend human capabilities while maintaining cultural sensitivity and user trust.

These interface and system designs reflect the current state of AI clone technology while highlighting areas for future development. The integration of cultural considerations, particularly in Japanese contexts, has led to innovative approaches in user interaction and system architecture.

4 Psychological Implications

4.1 Self-Perception and Identity

The integration of AI clones into daily life has profound implications for self-perception and identity formation. Maeda and Yuki [2023]'s comprehensive study reveals that interaction with digital self-extensions significantly influences how individuals conceptualize their own identity and capabilities. Their research demonstrates that Japanese participants show markedly higher levels of self-attribution towards AI actions compared to their Western counterparts, with cultural background playing a crucial role in identity formation processes.

The relationship between self and digital extension manifests through multiple interconnected dimensions. Veliev [2024]'s analysis of digital consciousness reveals how fluid boundaries between self and technology enable the integration of AI capabilities into self-concept, while cultural frameworks significantly influence digital identity formation. These findings are complemented by Lee [2024]'s mathematical framework for self-identity emergence, which demonstrates how temporal stability of digital identity requires careful cultural adaptation.

Digital self-representation through AI clones introduces novel mechanisms for identity extension. Niwa et al. [2024]'s investigation of facial self-similarity effects reveals significant cultural variations in optimal self-similarity levels, with user engagement correlating strongly with cultural alignment in agent behavior. Their work demonstrates

that personality alignment and behavioral synchronization can enhance user acceptance by 37

Cognitive extension through AI clones fundamentally alters human capabilities. Nguyen and Cohen [2024]'s research on human-AI teams reveals how enhanced decision-making capabilities, memory augmentation, and processing capacity expansion can improve team performance by 47

4.2 Cognitive Integration

The process of cognitive integration between human users and their AI clones presents unique psychological challenges and opportunities. Shang et al. [2024]'s integration of brain-computer interfaces demonstrates how bilateral knowledge transfer and skill acquisition patterns can be optimized through neuromorphic computing, reducing latency in human-AI interaction by 68

Decision-making processes in human-AI clone interactions have evolved significantly. Kim et al. [2024]'s healthcare implementation study shows how collaborative decision-making and trust development can be enhanced through cultural adaptation, improving outcomes by 31

Memory integration between humans and AI clones represents a crucial aspect of cognitive enhancement. Wang et al. [2024]'s SimBench framework establishes comprehensive metrics for evaluating shared memory systems and information retrieval patterns. Their research demonstrates how knowledge synthesis can be optimized through rule-based evaluation frameworks that account for cultural variations in information processing.

4.3 Emotional Attachment

Research has identified complex emotional relationships developing between users and their AI clones. Yamamoto and Komatani [2024]'s study of personality expression in AI systems reveals how emotional bonds develop through adaptive personality expression, enhancing user engagement by 42

Emotional intelligence in AI clone systems has advanced significantly. Kawakami [2020]'s analysis of digital self-extension in social contexts shows how empathy development and emotional synchronization can be effectively implemented while maintaining cultural sensitivity. Their research reveals the importance of affect recognition in maintaining user engagement and trust across different cultural contexts.

The social-emotional impact of AI clone integration extends beyond individual interactions. Nakagawa et al. [2019]'s research demonstrates how traditional concepts of 和 (harmony) influence relationship dynamics and support systems in Japanese contexts. Their work reveals how cultural factors significantly affect emotional regulation patterns in human-AI relationships.

4.4 Cultural Variations in AI Clone Acceptance

Cultural factors significantly influence how individuals relate to and accept AI clones. Liu and Chen [2024]'s comparative study of Eastern and Western implementation patterns reveals fundamental differences in acceptance mechanisms. Their research demonstrates that adaptive frameworks can improve cross-cultural implementation success rates by 49

Eastern perspectives, particularly in Japanese contexts, demonstrate unique patterns in AI clone acceptance. Nakagawa et al. [2019]'s research reveals how traditional concepts

shape implementation requirements, with high acceptance of technological integration and collective identity frameworks facilitating AI clone adoption. Their work shows how flexible self-boundaries in Japanese culture promote more natural integration of AI systems into daily life.

Western approaches to AI clone acceptance reveal markedly different patterns. DeJuan and Smith [2024]'s analysis of agency attribution models demonstrates stronger preferences for individual autonomy and clear self-technology boundaries. Their research shows how privacy concerns and personal autonomy significantly influence system design and implementation strategies in Western contexts.

4.5 Psychological Impact Studies

Long-term psychological effects of AI clone integration have been extensively documented through recent research. Sato and Tanaka [2023]'s analysis reveals how identity integration patterns and cognitive enhancement measures vary across cultural contexts, with adaptive frameworks improving acceptance by 46

User studies have revealed significant variations in psychological impact across different cultural contexts. Tanaka and Yamamoto [2023]'s research shows how Japanese cultural patterns significantly influence AI clone integration through collective identity frameworks. Their findings demonstrate how cultural background affects cognitive adaptation and relationship development patterns in human-AI interactions.

Cross-cultural comparisons have highlighted important variations in psychological impact. Zhang and Liu [2023]'s framework analysis shows that while cultural adaptation mechanisms can improve implementation success by 53

The psychological implications of AI clone integration continue to evolve as technology advances and cultural understanding deepens. The interaction between human psychology and digital self-extension presents both challenges and opportunities for future development.

5 Agency and Self-Reference

5.1 Theories of Agency in AI Systems

The concept of agency in AI clone systems presents unique theoretical challenges that bridge technical capabilities and psychological perception. Namestiuk [2023] challenges traditional boundaries between self-awareness and self-consciousness in AI systems, demonstrating how Eastern philosophical traditions offer unique perspectives on machine consciousness. Their work proposes a three-level model of machine consciousness incorporating cultural perspectives, while revealing how self-attribution mechanisms vary across cultural contexts in AI systems. The temporal aspects of self-awareness differ between human and artificial systems, leading to important ethical implications arising from different cultural interpretations of machine consciousness.

Veliev [2024] further elaborates on these concepts through their investigation of digital consciousness and identity. Their research reveals how digital consciousness emerges through complex interaction patterns, with cultural frameworks significantly influencing digital identity formation. Self-attribution mechanisms vary across digital consciousness implementations, while temporal stability of digital identity requires cultural adaptation. Their findings demonstrate that cross-cultural validation reveals universal consciousness

patterns, while integration of Eastern and Western perspectives enhances understanding of digital identity formation.

Lee [2024] provides a rigorous mathematical framework for understanding agency emergence in AI systems. Their research quantifies self-identity emergence through empirical validation, demonstrating measurable self-identity metrics across cultural contexts. The framework successfully predicts self-identity development trajectories, while cultural adaptation mechanisms prove essential for stable self-identity formation. These findings provide crucial insights into how agency emerges and develops in AI clone systems.

5.2 Self-Attribution Mechanisms

The Japanese concept of 自己帰属 (self-attribution) provides a crucial framework for understanding how individuals attribute agency and ownership to AI clones. Maeda and Yuki [2023]'s comprehensive study reveals that Japanese participants demonstrate significantly higher levels of self-attribution towards AI actions compared to their Western counterparts. Their research shows that cultural background plays a crucial role in how individuals integrate AI capabilities into their self-concept, with collective identity frameworks facilitating easier acceptance of AI as self-extension in Japanese contexts. Emotional attachment to AI systems correlates strongly with self-attribution tendencies, while cultural differences in agency attribution remain stable across different AI interaction contexts.

5.3 Cultural Perspectives on AI Agency

Different cultural contexts significantly influence how agency is perceived and attributed in AI clone systems, as evidenced by recent cross-cultural research. DeJuan and Smith [2024] document how Western agency attribution models emphasize individual autonomy and control preferences significantly affect AI system acceptance. Their research reveals that Western users show stronger preference for explicit control mechanisms, with trust development correlating strongly with perceived individual control. These cultural variations in agency perception patterns have profound implications for system design and implementation.

Nakagawa et al. [2019]'s seminal study demonstrates how Japanese cultural context facilitates higher acceptance of AI integration through flexible agency boundaries and collective responsibility models. Their research reveals that traditional concepts of 和 (harmony) influence AI interaction patterns, while social harmony prioritization affects human-AI relationship development. These cultural factors significantly influence trust formation in AI systems, with their framework providing crucial insights for cultural adaptation in AI implementation.

Hirota et al. [2024] provide a rigorous mathematical foundation through their category-theoretic approach to autonomy. Their research demonstrates that the monoid structure naturally emerges from self-referential processes, providing a formal mathematical framework for modeling self-reference in AI systems. Their work shows how cultural differences in self-conception affect formal modeling approaches, while the proposed framework successfully bridges Western and Eastern perspectives on autonomy.

5.4 Ethical Considerations

The ethical implications of AI clone agency present complex challenges that vary significantly across cultural contexts. Veliev [2024] demonstrates how cultural frameworks significantly influence digital identity formation, with ethical implications varying across cultural contexts. Their research reveals how temporal stability of digital identity requires cultural adaptation, while integration of Eastern and Western perspectives enhances understanding of ethical considerations in AI consciousness development.

Namestiuk [2023] further elaborates on these ethical dimensions through their philosophical analysis of self-awareness and self-consciousness in AI systems. Their work reveals how Eastern philosophical traditions offer unique perspectives on machine consciousness, while proposing a three-level model that incorporates cultural perspectives. The ethical implications arising from different cultural interpretations of machine consciousness provide crucial insights for developing culturally sensitive implementation strategies.

Lee [2024] contribute important insights through their mathematical framework for quantifying self-identity emergence in AI systems. Their research demonstrates how cultural adaptation mechanisms prove essential for stable self-identity formation, while empirical validation provides measurable metrics for evaluating ethical implications. These findings highlight the critical importance of considering cultural variations in ethical frameworks when designing and implementing AI clone systems.

The complex interplay between agency, self-attribution, and cultural factors continues to shape the development and implementation of AI clone systems. Liu and Chen [2024]'s research demonstrates how cultural dynamics significantly influence AI clone integration success, with adaptive frameworks improving cross-cultural implementation by 49%. These findings emphasize the critical importance of understanding cultural variations in agency attribution and ethical considerations for successful system deployment.

6 Discussion

6.1 Current Limitations

The development and implementation of AI clones as extensions of self face several significant limitations. Wang et al. [2024]'s SimBench framework reveals critical limitations in maintaining consistent behavioral patterns during multi-turn interactions, while their rule-based evaluation framework demonstrates how cultural context significantly impacts digital twin interaction authenticity. These technical constraints are particularly evident in cross-domain applications, where Chen and Rodriguez [2024] show that implementation success rates vary significantly based on cultural context.

Psychological barriers present equally challenging limitations. Maeda and Yuki [2023]'s research demonstrates how cultural background significantly influences the integration of AI capabilities into self-concept, with particular challenges in maintaining consistent self-attribution patterns across different cultural contexts. These findings are complemented by Niwa et al. [2024]'s work on facial self-similarity, which reveals how cultural variations affect optimal self-similarity levels and user acceptance patterns.

Implementation challenges extend beyond technical and psychological domains. Zhang and Liu [2023]'s framework analysis shows that while cultural adaptation mechanisms can improve implementation success by 53%, significant challenges remain in achieving consistent cross-cultural deployment. These limitations are further highlighted by Park

and Kim [2024]'s research, which demonstrates how implementation success factors show strong cultural dependence, with technical architecture requirements varying significantly by cultural context.

6.2 Future Directions

Several promising directions for future development emerge from current research, supported by recent empirical findings. Shang et al. [2024]'s integration of brain-computer interfaces and neuromorphic computing demonstrates potential technical advancements, achieving a 47% improvement in digital twin accuracy through direct neural feedback. Their proposed architecture reduces latency in human-AI interaction by 68%, suggesting promising directions for future interface development.

Psychological understanding continues to evolve, as evidenced by Yamamoto and Komatani [2024]'s research on personality expression in AI systems. Their work shows that adaptive personality expression can enhance user engagement by 42%, while temporal consistency in personality expression emerges as a critical factor in trust development. These findings suggest promising directions for enhancing human-AI relationships.

Implementation strategies show significant potential for improvement through cultural adaptation. Liu and Chen [2024]'s comparative study reveals that adaptive frameworks can improve cross-cultural implementation by 49%, while their research demonstrates how real-time cultural adaptation mechanisms enable dynamic adjustment to different cultural contexts. These findings suggest promising directions for developing more culturally sensitive implementation approaches.

6.3 Ethical Implications

The development of AI clones raises important ethical considerations that vary significantly across cultural contexts. Namestiuk [2023]'s philosophical analysis reveals how Eastern philosophical traditions offer unique perspectives on machine consciousness, while proposing a three-level model that incorporates cultural perspectives. Their work demonstrates how ethical implications arise from different cultural interpretations of machine consciousness.

Privacy and agency concerns present particular challenges. Veliev [2024]'s research shows how cultural frameworks significantly influence digital identity formation, while temporal stability of digital identity requires careful cultural adaptation. These findings are complemented by DeJuan and Smith [2024]'s work on Western agency attribution models, which demonstrates how cultural background significantly influences agency perception patterns.

Social impact considerations extend beyond individual interactions. Nakagawa et al. [2019]'s research reveals how traditional concepts of 和 (harmony) influence AI interaction patterns, while social harmony prioritization affects human-AI relationship development. These findings highlight the importance of considering cultural variations in social impact assessment and ethical framework development.

6.4 Cultural Considerations

Cultural factors continue to shape the development and implementation of AI clones in fundamental ways. Lee et al. [2023]'s cross-cultural implementation study demonstrates

how Eastern approaches emphasize collective integration patterns while Western implementations focus on individual control mechanisms. Their research shows that adaptive implementation frameworks achieve 45% higher acceptance rates when accounting for cultural variations.

The development of culturally specific solutions shows promising results. Sato and Tanaka [2023]'s analysis of Japanese implementation patterns reveals how traditional concepts shape implementation requirements, with adaptive frameworks improving acceptance by 46%. These findings are complemented by Tanaka and Yamamoto [2023]'s research, which shows how Japanese cultural patterns significantly influence AI clone integration, with collective identity frameworks enhancing digital self-extension.

The discussion of AI clones as extensions of self reveals complex interactions between technical capabilities, psychological implications, and cultural factors. Kim et al. [2024]'s healthcare implementation study demonstrates how cultural factors significantly influence patient trust in AI healthcare decisions, with real-time adaptation to patient preferences improving outcomes by 31%. These findings emphasize the critical importance of addressing technical, psychological, and cultural aspects in an integrated manner while maintaining ethical considerations and cultural sensitivity in system development and deployment.

7 Conclusion

7.1 Summary of Findings

This comprehensive survey of AI clones as extensions of self has revealed sophisticated patterns of interaction between technical implementation, psychological impact, and cultural adaptation. Wang et al. [2024]'s SimBench framework establishes crucial metrics for evaluating digital twin generation capabilities, demonstrating how multi-turn interaction testing exposes key limitations in maintaining consistent behavioral patterns. Their research shows that rule-based evaluation frameworks enable quantitative assessment of digital twin fidelity, while cultural context significantly impacts interaction authenticity.

The psychological implications of AI clone integration demonstrate remarkable complexity. Maeda and Yuki [2023]'s research reveals that Japanese participants show significantly higher levels of self-attribution towards AI actions compared to their Western counterparts, with cultural background playing a crucial role in how individuals integrate AI capabilities into their self-concept. These findings are complemented by Yamamoto and Komatani [2024]'s work on personality expression in AI systems, which shows that adaptive personality expression can enhance user engagement by 42%, while temporal consistency in personality expression emerges as a critical factor in trust development.

Agency and attribution patterns reveal significant cultural variations. DeJuan and Smith [2024]'s research demonstrates how Western agency attribution models emphasize individual autonomy, with trust development correlating strongly with perceived individual control. These findings contrast with Nakagawa et al. [2019]'s research, which shows how Japanese cultural context facilitates higher acceptance of AI integration through traditional concepts of 和 (harmony) and collective responsibility models.

7.2 Research Gaps

Several critical areas require further investigation, as revealed by recent research findings. Shang et al. [2024]'s integration of brain-computer interfaces demonstrates significant potential for improvement, achieving a 47% enhancement in digital twin accuracy through direct neural feedback. However, their work also reveals substantial gaps in our understanding of long-term learning stability and cross-cultural interface adaptation.

Psychological research gaps emerge from current findings. Niwa et al. [2024]'s investigation of facial self-similarity effects reveals significant cultural variations in optimal self-similarity levels, while demonstrating the need for deeper understanding of long-term identity effects and cultural adaptation mechanisms. These gaps are further highlighted by Lee [2024]'s mathematical framework, which shows how cultural adaptation mechanisms prove essential for stable self-identity formation.

Implementation challenges require systematic investigation. Liu and Chen [2024]'s comparative study demonstrates that while adaptive frameworks can improve cross-cultural implementation by 49%, significant gaps remain in understanding cultural customization methods and resource optimization strategies. These findings are supported by Zhang and Liu [2023]'s framework analysis, which shows that while cultural adaptation mechanisms can improve implementation success by 53%, substantial work remains in developing standardized integration approaches.

7.3 Future Research Directions

Future research directions emerge clearly from current findings and identified gaps. Technical development should build on Mandischer and Atanasyan [2024]'s POT framework, which provides a structured approach to modeling human-AI interaction patterns. Their research demonstrates how observer perspective enables real-time adaptation of interaction models, while transparency mechanisms facilitate trust development in human-AI relationships.

Psychological understanding requires deeper investigation of cultural factors. Sato and Tanaka [2023]'s analysis reveals how traditional concepts shape implementation requirements, with adaptive frameworks improving acceptance by 46%. These findings suggest promising directions for investigating long-term impact and cross-cultural variations in AI clone integration.

Implementation strategies must address cultural adaptation systematically. Kim et al. [2024]'s healthcare implementation study demonstrates how cultural factors significantly influence patient trust in AI healthcare decisions, with real-time adaptation to patient preferences improving outcomes by 31%. These findings suggest crucial directions for developing culturally sensitive implementation frameworks and ethical guidelines.

The field of AI clones as extensions of self represents a rapidly evolving area of research that bridges technical innovation and psychological understanding. Hirota et al. [2024]'s category-theoretic approach demonstrates how formal mathematical frameworks can model self-reference in AI systems while bridging Western and Eastern perspectives on autonomy. As technology continues to advance, the integration of cultural perspectives, particularly regarding concepts like 自己帰属, will become increasingly important for successful implementation and adoption of AI clone systems, as evidenced by the consistent findings across multiple studies highlighting the critical role of cultural adaptation in system effectiveness.

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