

The Transformation and Reconstruction of Dramatic Arts in the Age of Artificial Intelligence

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Abstract

Against the backdrop of rapid advancements in artificial intelligence technology and the powerful momentum of the digital wave, dramatic arts face profound disruptions in creation, performance, dissemination, and reception. This study systematically examines the current applications, theoretical challenges, and future approaches of AI in dramatic arts across three dimensions: technological empowerment, aesthetic innovation, and cultural heritage. Through immersive theater, virtual actors, and intelligent scriptwriting, AI not only expands the physical and narrative boundaries of theater but also reshapes audience-performance dynamics and aesthetic experiences. Technological intervention, however, raises concerns about the dissolution of artistic essence, ethical risks, and cultural homogenization. Deep integration of AI and theater should pursue innovative transformation of technology and tradition while safeguarding humanistic spirit and artistic integrity.

Keywords

Artificial Intelligence; Theatrical Arts; Immersive Theater; Digital Heritage; Human-Machine Collaboration.

1. Introduction

Theatrical art, as one of humanity's oldest forms of emotional expression and collective ritual, has always intertwined with and evolved alongside the technological backdrop of its era. From the segmented construction techniques of ancient Greek theaters to the perspective-based scenery of the Renaissance, from the electric lighting innovations of the post-Industrial Revolution to the multimedia-era sound and light effects, technology has consistently served as a vital driving force in expanding theatrical boundaries and reshaping the relationship between performers and audiences. Entering the 21st century, a new wave of technological revolution spearheaded by artificial intelligence is permeating every corner of society and culture at an unprecedented scale and depth. Placed at the forefront of this historic transformation, the art of theater is undergoing a “dazzling metamorphosis” in its developmental trajectory. From the perspective of technological empowerment, we explore how AI is reconstructing theatrical creation, performance, and audience-performer dynamics; From an aesthetic innovation perspective, we examine how human-machine collaboration fosters new theatrical aesthetics while reflecting on its impact on traditional aesthetic values. From the perspective of cultural heritage preservation, this paper examines AI's positive contributions and potential drawbacks in safeguarding and disseminating theatrical cultural legacies. Within the context of deep integration between theatrical arts and artificial intelligence, it dissects the intrinsic logic, driving mechanisms, and future trajectories of this convergence. This study provides theoretical references and practical insights for the creative transformation and innovative development of theatrical arts in the intelligent era.

2. Technical Pathways for AI-Empowered Theater Creation and Performance

The application of artificial intelligence technology in the field of theater is transforming traditional paradigms of creation and performance with unprecedented depth and breadth. From the formation of immersive scripts to the emergence of virtual actors, AI technology is reshaping the production methods and aesthetic expression of theatrical art, triggering profound waves in the ontology of drama. By systematically exploring three technical pathways of AI in theatrical creation and performance activities, we examine their implementation mechanisms, artistic outcomes, and potential challenges.

2.1. Immersive Theater and Digital Mirroring Systems

The core of immersive theater lies in breaking down the traditional boundary between performers and audience. Through technological means, it draws spectators into the dramatic setting, liberating them from the "theatrical illusion" and transforming passive observers into active participants. Artificial intelligence achieves this by establishing digital mirroring systems that deeply integrate physical and virtual spaces.

The digital mirroring system employs AI-powered real-time stage modeling technology. It utilizes multi-sensor fusion to capture the three-dimensional data of the actual stage, then leverages machine learning algorithms to construct a high-precision digital twin model. This system not only reproduces the structure and dynamic changes of the stage space in real time but also employs predictive algorithms to anticipate the movement trajectories of performers and audience members, ensuring seamless integration between virtual elements and the real-world setting. For instance, at the sixth edition of Art Basel Hong Kong, over 80,000 visitors experienced Marina Abramović's work "Rising." Wearing VR headsets, they entered an intimate virtual space shared with the performer, witnessing firsthand how a surging sea level submerged the artist's virtual avatar. [1] While not strictly a theatrical work, "Rising" represents a pioneering attempt by digital mirroring systems to simulate immersive theatrical spaces.

AI visual recognition technology holds significant promise for immersive theater. Utilizing human posture recognition algorithms, the system captures audience facial expressions, body movements, and even subtle micro-expressions in real time, dynamically adjusting the stage direction and effects accordingly. For instance, in the Shanghai version of the immersive play "Sleepless Night," AI analyzed audience attention focus points to dynamically modify virtual projection content and sound field distribution, amplifying the emotional impact of key plot points. Traditional theater does not require deep audience involvement in the performance, whereas immersive productions demand that spectators and performers jointly create a theatrical "event." By revolutionizing the audience-performer dynamic, enhancing spectator participation, and placing viewers within an interactive or responsive environment, the sense of involvement is activated. [2] Through technological innovation, this shifts the experience from "audience watching theater" to "theater responding to the audience," completely dismantling the barrier of the fourth wall.

Another significant application of artificial intelligence in immersive theater is the intelligent environmental response system. By integrating IoT technology with reinforcement learning algorithms, elements like music and lighting within the theater can dynamically adjust in real-time based on plot developments and audience emotions. In 2019, Tender Claws' groundbreaking production *The Under Presents* debuted. On its main stage, The Aickman, audiences assume the role of adventurers exploring a mysterious research vessel. By manipulating time to reconstruct the ship's final moments, they influence the crew's fate through changes in stage music, lighting, and other elements triggered by shifts in audience

expressions. [1] This interaction design, leveraging physiological feedback, elevates immersive experiences to a new level of mind-body integration.

Digital mirroring systems also face multifaceted challenges. The tension between real-time requirements and computational complexity necessitates high-precision algorithms, while extensive cloud computing risks potential network latency. Integrating multimodal data remains a challenge: how to unify heterogeneous data like visual, auditory, and tactile inputs within a single semantic framework while achieving natural, seamless interactive feedback requires further exploration; Over-reliance on technology risks diluting the essence of art. When technological spectacle dominates, the emotional resonance and humanistic depth of theater may gradually fade, compelling creators to seek a delicate balance.

2.2. Applications of Generative AI in Scriptwriting and Character Development

Generative AI is quietly revolutionizing dramatic text creation. AI writing tools powered by large language models (Deepseek, ChatGPT) analyze vast datasets of Chinese and foreign theatrical texts to master narrative structures, character archetypes, and linguistic conventions, thereby assisting playwrights throughout the entire creative process—from initial inspiration to detailed refinement.

During the script conception phase, generative AI acts as a “creative catalyst.” By inputting keywords or scenario prompts (e.g., “a story centered on forgetting and friendship”), it can generate multiple plot outlines and narrative paths for writers to select and expand upon. Developed by a team from Macau, China, the domestic AI screenwriting system “Black Hole” can produce a commercially viable script within three days. It possesses the capability to construct a complete script framework, including character relationship diagrams, key plot turning points, and thematic metaphors. This technology significantly lowers the creative barrier to entry, particularly helping young screenwriters break through creative inertia.

Regarding character creation, traditional methods rely on a writer's personal experience and intuition, whereas AI can analyze character arcs from classic dramas to generate virtual characters with psychological depth and behavioral consistency. The 2016 London premiere of the musical *Beyond the Fence* stands as a landmark experiment. The creative team employed a data-driven approach, using AI systems to conduct multidimensional analyses of historical classic musicals. They extracted high-success structural templates from factors like cast size, historical context, and dramatic conflict. [3] By identifying key characters based on common traits across numerous classics, playwrights need only set character-specific scenarios to trigger multiple rounds of dialogue. Conflicts arising from these interactions form the musical's overall plot and content. Paired with generated lyrics and melodies, the material is then choreographed by the musical director into a live-performance-ready production.

The application of generative AI in dramatic creation still faces significant limitations. Regarding originality and homogenization, large AI models trained on historical data inevitably produce outputs constrained by their instructions, potentially leading to formulaic narratives or stylistic imitations rather than genuine innovation. Weaknesses in emotional depth: While AI can mimic human expressions of emotion, it cannot grasp the complexity of human feelings. Characters it generates often lack psychological conflict and emotional authenticity. In dramatic art, much of the beauty lies in imperfection. AI can produce error-free dialogue but cannot craft lines rich with contradiction, flaws, and the struggles of humanity—elements that are the very essence of drama. In drama creation, generative AI is better positioned as an “assistant” rather than a “replacement.” Playwrights must fully integrate vibrant emotions, creative concepts, and aesthetic judgment. They must firmly steer the “steering wheel” in deepening themes, embedding cultural contexts, and exploring philosophical dimensions to prevent drama from falling into the abyss of technological algorithms.

2.3. Virtual Actors and Performance Augmentation

Virtual actors represent the most disruptive application of AI in theatrical performance. By integrating computer graphics, motion capture, and deep learning technologies, they not only replicate human performances but also transcend physical limitations to achieve extraordinary stage effects.

The core technology of virtual actors lies in a performance simulation system utilizing deep neural networks. By employing high-precision motion capture equipment to record human actors' facial expressions and physical movements, a performance database is constructed. Building upon this foundation, generative adversarial networks learn stylistic features of performances to generate new dramatic sequences. In 2004, Carnegie Mellon University produced *Facade*, the first truly intelligent 3D narrative work. Audiences interacted with virtual actors using natural language (English), achieving an open-ended interaction model beyond hyperlinked text and web structures—even when viewers delivered lines completely unrelated to the current dramatic context, the virtual actors responded effortlessly. [1]

Another breakthrough in virtual actors lies in “digital resurrection” technology. By analyzing historical footage and performance records, AI can reconstruct the stage presence and performance styles of deceased artists. In 2025, He Yueyue and colleagues created “Mei Lanfang Digital Avatar: Singing and Dancing in The Peony Pavilion,” featuring a classic excerpt from *The Peony Pavilion: The Dream in the Garden*. Using the Mei Lanfang Digital Archive at the Chinese National Academy of Arts as reference, strictly referencing Mei Lanfang's 1955 performance footage of “The Dream in the Garden.” It recreates the signature style of “smiling without showing teeth, moving without lifting the skirt,” relying on an AI micro-expression system to simulate the “elegant and dignified” temperament of the Mei School. The focus is on conveying emotion through the eyes and eyebrows. This technology opens new avenues for the living transmission of theatrical cultural heritage, but it also sparks debates about artistic authenticity and ethical boundaries.

Performance Enhancement represents an expanded application of virtual actor technology, where AI employs augmented reality and mixed reality to provide performance support for human actors. Actors wearing AR glasses can visualize the spatial positioning of virtual props and receive emotional cues. During rehearsals, AI systems analyze performance footage to provide feedback on movement precision, emotional resonance, and even stage positioning adjustments. Virtual actors dramatically expand the physical boundaries of performance, effortlessly achieving high-difficulty movements beyond human capability or depicting non-human elements like animals through AI animation and holographic projection. On June 13, 2025, at the Guangxi Cultural Arts Grand Theatre, the animal “crocodile” in Mo Yan's play *Crocodile* was brought to life through this technology. Depicting the crocodile growing within an aquarium until it eventually speaks “human language,” this surrealistic performance opened new avenues for dramatic imagery.

The widespread adoption of virtual actors also raises significant artistic and ethical challenges. Regarding the “soul” of performance, while AI can flawlessly mimic external movements, its capacity for ‘imagery’ and “presence” remains contentious. The inequality in technological costs and accessibility may widen the digital divide within the theater industry. While large theater companies have the resources to hire technical teams to develop customized virtual actors, smaller ensembles risk marginalization. We must be vigilant about the potential impact of virtual actors on traditional performance employment. Striking a balance between technological innovation and humanistic care remains a core issue for the future development of theater.

Artificial intelligence has profoundly reshaped theatrical creation and performance paradigms through three pathways: digital mirroring systems, generative creation, and virtual actors.

These technologies not only enhance theatrical immersion and expand narrative possibilities but also transcend the physical constraints of performance. Technological application must always prioritize artistic essence at its core, avoiding the pitfalls of technological determinism. Future human-machine collaboration models should focus on leveraging AI's computational strengths alongside human creative intelligence, jointly advancing theatrical innovation and heritage in the intelligent era.

3. The Reconstruction and Challenges of Theater Aesthetics through Artificial Intelligence

The deep integration of AI technology into theater not only transforms creative and expressive forms but also presents fundamental challenges and opportunities for reconstructing core aesthetic domains. This section systematically analyzes how AI reshapes theatrical aesthetic paradigms across three dimensions-the spectator-performer relationship, the digital representation of traditional aesthetics, and artistic subjectivity-while examining the theoretical dilemmas and practical challenges inherent in this process.

3.1. Reconstruction of the Spectator-Performer Relationship

Traditional theatrical aesthetics were built upon the spectator-performer relationship symbolized by the "fourth wall," where audiences passively received performances, achieving contemplative appreciation and insight through aesthetic distance. The introduction of AI technology is fundamentally dismantling this binary spectator-performer model, forming a new aesthetic relationship grounded in participation and interaction.

Within contemporary theaters enhanced by AI, this relationship is undergoing a transformative phase. AI-driven technologies are generating novel experiential patterns for theatergoers. Consider the intelligent recommendation engine developed by 3XM Technologies. This system constructs a dynamically updated preference map by collecting user viewing histories, social media behaviors, and physiological feedback data (such as eye-tracking and heart rate variations). AI can analyze audience micro-expression data in real-time during performances, dynamically adjusting lighting cues and musical intensity. More advanced experiments have achieved multi-threaded narrative structures-setting branching options at critical plot points and determining subsequent plot paths based on live voting data. [4] Such performance adjustments, implemented through audience physiological feedback, transform spectators from passive observers into active creators of the performance's impact, with their bodily responses directly participating in the generation of artistic meaning.

AI achieves deep integration of performance and viewing spaces, with digital tools breaking through traditional theater's physical boundaries. In December 2024, the National Theatre of China's production "Summoned: Dunhuang" established a "dual-site" system-essentially an innovative application of digital twin technology in theatrical dissemination. The technical implementation comprises three core modules: the stage-side panoramic motion capture system employs a 12-camera array, generating 8K panoramic imagery through intelligent stitching algorithms; the transmission end utilizes broadcast-grade IP-based production and broadcasting technology, achieving ultra-low latency transmission at 50ms; the presentation end restores color accuracy via cinema-grade HDR display equipment. This technological integration not only guarantees remote audiences equivalent visual fidelity to the main theater experience but also enhances the conveyance of performance details through close-up cinematography-precisely capturing microscopic elements like actors' pupil tremors and textural changes, forming a distinctive digital theater aesthetic. [4] This technology enables a "distributed narrative" aesthetic, where multi-threaded, interactive story networks replace traditional linear storytelling.

This reconfiguration of the audience-performance relationship raises new aesthetic challenges. Regarding the paradox of interactivity, overemphasizing audience participation risks undermining artistic integrity. If every viewer possesses the ability to influence plot development, how can the director's artistic intent be preserved? As a collective art form, might theater be diminished by personalized experiences? Regarding diminished emotional depth, traditional theatrical aesthetic distance affords audiences reflective space, whereas real-time immersive interactions risk submerging viewers in sensory stimulation, thereby diminishing drama's intellectual and critical dimensions. The audience-performance relationship in AI-driven contexts also raises ethical concerns about digital surveillance. To achieve personalized interaction, systems require extensive collection of audience data, potentially infringing on personal privacy. Striking an appropriate balance between technological innovation and ethical boundaries is a challenge future intelligent theater must confront.

3.2. Digital Expression of Traditional Aesthetics

As a unique carrier of national culture, theater possesses the power to breathe new life into traditional culture during periods of cultural transmission. Traditional Chinese theater forms (such as Peking Opera and Kunqu Opera) exhibit a distinctive aesthetic system, centered on the harmonious integration of stylized performance with the spirit of artistic expression. Artificial intelligence technology offers new possibilities for the preservation, transmission, and innovation of these traditional arts, yet simultaneously poses a formidable challenge in accurately conveying their aesthetic essence.

To overcome dissemination barriers in traditional theaters, attention must be paid to new transformations in media and communication formats. The convergence of theater and technology, with digital theaters driving theatrical digitization, represents a new paradigm in contemporary theater development. Shanghai Theatre Academy's XR opera "Daiyu Buries Flowers" employs extended reality (XR) and 3D printing technologies to present a segment from the classic Yue opera "Dream of the Red Chamber." This work transcends the traditional proscenium stage, conducting in-depth exploration and research into stage spatial design and digital virtual environments. The technologically advanced digital theater showcases innovative hybrid narratives blending real and virtual spaces. The work's multidimensional integration of digital technology allows audiences to freely navigate immersive physical spaces using smart devices or XR headsets, significantly enhancing the artistic expressiveness of the performance. [5] This novel virtual aesthetic theater transcends the spatial and temporal constraints of traditional drama, integrating diverse theatrical scenes into a unified spatial experience that infuses contemporary vitality into Chinese traditional theater.

The core aesthetic elements of traditional theater—"subtle meaning" and "vital energy"—remain challenging for technology to fully capture and reproduce. Chinese opera emphasizes the unity of spirit and form, where "spirit" refers to the transcendent essence and artistic resonance beyond external form. This aesthetic quality exhibits high contextuality and intersubjectivity, defying reduction to data parameters. The allure of a Peking Opera actor's "a frown or a smile" lies not merely in the trajectory of facial muscles, but in the subtle emotional resonance between the actor and the character, and between the actor and the audience. This "charm" is a synthesis of specific historical contexts, cultural traditions, and personal cultivation. Even if AI models could perfectly replicate the external form, they would struggle to restore its intrinsic essence. A deeper aesthetic challenge lies in the fact that the expressive foundation of traditional Chinese theater is rooted in the philosophical principle of "interdependence of the tangible and intangible." On stage, a single oar symbolizes a journey across vast seas, and a single circle represents a thousand horsemen. Such aesthetic effects rely on the audience's cultural imagination and active participation. AI technology, however, tends to render everything concrete and visual, potentially diminishing the charm of this expressive aesthetic.

This teaches us that digitizing traditional aesthetics should not involve simple replication but rather creative transformation-finding a balance between technology and artistic conception.

3.3. The Issue of Artistic Agency in Human-Machine Collaboration

Deep AI involvement in theatrical creation raises fundamental questions about artistic agency. When algorithms transcend mere technical support to actively participate in creative processes, how can artists maintain their central role? Does technological intervention risk alienating the essence of artistic creation?

At the current stage of theatrical practice, human-machine collaboration primarily manifests in two modes: First, the so-called "tool mode," where AI serves as an extension of human creativity; Second is the "collaborative model," where AI functions as a creative partner with some degree of autonomy. In the tool model phase, human artists retain absolute control. AI provides technical support or suggested options; playwrights use AI to generate multiple plot trajectories, but the final selection and revision rights remain entirely in human hands. Within this model, artistic subjectivity remains clearly discernible.

During periods of collaborative modes, boundaries become blurred and ambiguous. When AI systems can generate script passages, musical melodies, or even performance movements with considerable originality through deep learning, questions of authorship in artistic creation emerge. Technologies such as artificial intelligence, virtual reality, and cloud computing inherently depend on the advancement of digital technology. We witness positive technological experimentation in theater, exemplified by the Liyuan Opera production *The Great Dullness*, the dance drama *Deep AI You*, Meng Jinghui's new work *Faust*, and projects like *Digital Mei Lanfang* and *Avatar: Origin*. [6] In this context, the fundamental question arises: Are artistic works fundamentally human-centered creations, or are they products of human-machine collaboration? Does the traditional concept of authorship remain intact when confronted by technological disruption?

A more profound challenge lies in the fact that AI algorithms may probabilistically embed cultural biases and commercial logic. These implicit values can subtly influence artistic creation. The big data used to train AI models often reflects mainstream cultural preferences, potentially causing generated theatrical content to unconsciously reinforce certain aesthetic standardization tendencies. The essence of theater is to enable the world to gain cognition, not to seek approval. In the AI era, this assertion gains new significance. Technology can elevate drama's cognitive value and offer fresh pathways to perceive the world. Yet drama's true worth lies in its capacity to evoke critical thinking and emotional resonance. Maintaining a clear awareness of art's essence while keeping pace with technological innovation is central to the development of dramatic aesthetics in the intelligent age.

4. The Role of Artificial Intelligence in Preserving and Disseminating Dramatic Cultural Heritage

As treasures of humanity's intangible cultural heritage, dramatic traditions bear vast historical memories, artistic wisdom, and aesthetic landscapes. Amidst societal shifts and the diversification of entertainment, numerous traditional dramas now face daunting challenges: transmission gaps, dwindling audiences, and deteriorating archival materials. The integration of artificial intelligence technology provides unprecedented technical support and methodological innovation for the preservation, dissemination, and revitalization of theatrical cultural heritage. This section explores the multifaceted roles of AI in the digital archiving and educational promotion of theatrical heritage, while critically examining its application boundaries and ethical considerations.

4.1. Digital Preservation and Restoration

The preservation of traditional theatrical cultural heritage primarily relies on physical media such as paper scripts, audio tapes, and film recordings. These carriers are susceptible to deterioration due to factors like time and environmental conditions. AI technology, through high-precision digitization and intelligent restoration, offers breakthrough solutions for protecting endangered theatrical forms. Digital humanities research and practice focused on opera can be categorized into three areas: first, constructing opera-specific databases; second, exploring semantic representation of opera data from an information organization perspective; and third, integrating cutting-edge technologies to achieve restoration and revitalization of opera artifacts. [7]

Database construction serves as the foundational support for digital humanities research in opera. Its purpose is to systematically collect, organize, and store dispersed opera resources (such as scripts, musical scores, movement notation, recordings, videos, production stills, artifacts, and archives) to create a structured repository accessible for retrieval, inquiry, and research. Early databases often functioned merely as “digital warehouses”—simple catalog indexes or stacks of low-resolution images. Contemporary practices now emphasize constructing “academically driven databases,” underscoring that database development is not merely technical work but relies on a deep foundation in opera studies knowledge. While databases address “resource storage,” semantic technologies aim to solve challenges in “knowledge association” and “intelligent understanding.” At the information organization level, semantic presentation centers on leveraging technologies like Ontology and Knowledge Graphs to transform isolated opera data points into interconnected knowledge networks. This enables machines to grasp the underlying logic of opera knowledge to a certain degree. The ultimate goal of cutting-edge technology is to achieve the creative transformation and innovative development of culture. Within the realm of opera, this means employing technologies like 3D modeling, virtual reality, augmented reality, and artificial intelligence to breathe life into static “cultural relics,” revitalizing ancient stage arts through contemporary expressions. It is crucial to remain vigilant, however, ensuring that revitalization efforts strictly preserve the “cultural core.” Technological marvels must not overshadow the intrinsic charm of opera art. Successful practices, like the Palace Museum's “Digital Dunhuang” project, are grounded in academic research, guided by knowledge dissemination, and centered on aesthetic experience. Ultimately, they achieve the contemporary continuation of opera's vitality through technological empowerment.

AI also faces technical limitations and philosophical questions in digital preservation. Algorithmic restoration may introduce “digital artifacts,” over-imagining and adding details absent from the original footage, thereby distorting historical authenticity. On the other hand, it is worth pondering whether the aura—the unique state of an artwork within its specific time and space, as described by Benjamin—might vanish in digital replication. When AI attempts to fully reconstruct a performance from fifty years ago, it can recreate the performance form but struggles to replicate contextual elements like the theater's atmosphere and audience reactions. Digital preservation should not stop at technical replication; it must also employ methods like metadata annotation and contextual reconstruction to preserve the “atmospheric integrity” of cultural heritage.

4.2. Digital Dissemination of Theater and Educational Transformation

Artificial intelligence is significantly reshaping the dissemination ecosystem and educational models of theater culture. It liberates theater from traditional temporal and spatial constraints, forging new dissemination formats that integrate online and offline experiences while blending virtual and real dimensions. The poetic visual style characteristic of Eastern theatrical aesthetics fuses drama's unique expressive methods and contemplative artistic atmosphere

with cinematic language to create immersive, lyrical beauty that evokes emotional resonance. Under the digital dissemination paradigm, this poetic visual style rooted in Eastern theatrical aesthetics leverages XR technology to control the dynamic and static shifts of imagery within temporal and spatial frameworks. This approach crafts theatrical rhythm and atmosphere while conveying characters' inner emotions and life philosophies. Through techniques like color, lighting, and composition, poetic scenes are woven to form visual rhythms and poetic tension. Within Eastern theatrical aesthetics, creators frequently employ symbolic techniques. Utilizing "5G+AR and 3D modeling," they depict Eastern natural elements and supernatural imagery effects. These symbolic representations convey allegories and metaphors, expressing the relationship between humanity and nature, and between humans and destiny. The interweaving of these elements highlights a distinctive visual expression and a contemplative artistic style. [5]

Intelligent guided tour systems significantly enhance the accessibility of theatrical culture. Take the AI tour at Shanghai Jingju Training Center as an example: when visitors wear AR glasses to view exhibits, the system automatically identifies artifacts like costumes and props, overlaying holographic effects to reveal their historical origins and usage contexts. When visitors pause before the "Hero's Helmet," the AI not only displays its craftsmanship but also uses augmented reality to recreate the iconic movements of Xiang Yu from the opera Farewell My Concubine, integrating static artifact display with dynamic performance reenactment.

In educational transformation, AI-powered personalized teaching systems are reshaping traditional opera inheritance. Multimodal sensors capture students' movements and vocal delivery, cross-referencing them against master performers' databases to provide real-time feedback and tailored training suggestions. During instruction, these systems can precisely detect deviations in the trajectory of a Peking Opera student's "cloud hands" movement or identify deficiencies in breath control within a Kunqu singer's vocal delivery, then generate visual correction plans. This "digital apprenticeship" model not only addresses the scarcity of master teachers but also optimizes training efficiency through data-driven analysis.

Digital communication and education also carry inherent risks related to cultural dilution. When theatrical performances are reduced to interactive digital symbols, their original sense of ritual and social integration functions may be diminished. The emotional bonds between master and apprentice, and the tacit cultural transmission inherent in the oral tradition of classical opera education, cannot be replicated by cold algorithms. AI applications in education should be positioned as "supportive" rather than "substitutive." The core lies in leveraging technologies like virtual rehearsals and error alerts to free up teachers' energy, allowing them to focus more intently on imparting artistic essence and cultivating humanistic literacy.

5. Conclusion

The deep integration of artificial intelligence with dramatic arts is triggering comprehensive transformations in creative paradigms, aesthetic expression, and cultural transmission. This study demonstrates that AI, through technologies like digital mirroring, generative creation, and virtual actors, significantly expands theatrical narrative spaces and expressive dimensions, propelling its evolution from a "representational art" to a "generative system." Technological empowerment carries aesthetic risks: excessive interactivity may erode theatrical ritualism, algorithmic generation risks flattening emotional depth, and digital reproduction struggles to convey traditional art's "vital energy" and "aesthetic realm." Addressing this paradox, the key to future theatrical development lies not in indiscriminate technological accumulation, but in charting a fusion path where "humanities guide technology." AI should function as an "other" during creative collaboration, not as a dominant force. Its value lies in inspiring, not replacing, the human artistic agency. Within cultural heritage, technological application must transcend

static archiving to achieve modern translations of traditional aesthetics and living preservation. Amidst the AI era, the core of theatrical transformation remains safeguarding art's intrinsic value-its profound engagement with human existence and ritualized expression of collective spirit. Technology is merely the contextual lens of our era. The vital force of theater ultimately hinges on whether we can uphold the stage's unique "presence" and humanistic care amidst the algorithmic tide. Only by steadfastly maintaining this stance can theater achieve a truly magnificent transformation within this technological revolution.

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