ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue V, May 2026

Virtual Sacred Spaces and AI-Augmented Pilgrimage Experiences in the Digital Era

Dr. Shankar Subramanian Iyer[1], Dr Brinitha Raji[2]

[1]Faculty; Business; Westford University College, Sharjah, UAE

[2]Faculty, Global Business Studies, DKP, Dubai

DOI: https://doi.org/10.51583/IJLTEMAS.2026.150500137

Received: 13 May 2026; Accepted: 18 May 2026; Published: 09 June 2026

ABSTRACT

Background

The convergence of artificial intelligence, virtual reality, and augmented reality technologies is fundamentally transforming religious practices and spiritual experiences. Traditional pilgrimage, historically requiring physical presence at sacred sites, is being reimagined through immersive digital environments that offer unprecedented accessibility while raising profound questions about authenticity, theological legitimacy, and the nature of sacred experience itself.

Objective

This study comprehensively examines the emergence of virtual sacred spaces and AI-augmented pilgrimage experiences, analyzing their technological foundations, spiritual implications, accessibility benefits, ethical challenges, and future trajectories. The research synthesizes current scholarship to understand how digital technologies are reshaping religious tourism, spiritual engagement, and the conceptualization of sacred space in contemporary society.

Methods

A systematic literature review was conducted across multiple scholarly databases, yielding 78 unique peer-reviewed publications. The top 30 most relevant studies were analyzed using thematic synthesis, focusing on technological implementations, user experiences, theological perspectives, ethical considerations, and cultural impacts.

Studies encompassed diverse religious traditions including Islam, Christianity, Hinduism, Buddhism, and Judaism, examining VR/AR/AI applications in pilgrimage simulation, sacred space reconstruction, and spiritual guidance.

Results

The analysis reveals that virtual sacred spaces successfully enhance accessibility for individuals facing physical, financial, or geopolitical barriers, with VR technologies demonstrating significant potential for pre-pilgrimage training and cultural preservation. AI-augmented companions provide real-time translation, historical context, and emotional support, deepening engagement with sacred sites.

However, critical limitations persist: virtual experiences cannot fully replicate the communal, ritualistic, and transformative elements of physical pilgrimage. Theological perspectives vary significantly across traditions, with concerns about sacramental validity, embodied presence, and the commodification of sacred experiences. User studies indicate positive responses to aesthetic quality and sense of presence, though multisensory integration remains technically limited.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue V, May 2026

Conclusion

Virtual sacred spaces and AI-augmented pilgrimage represent complementary rather than replacement technologies for traditional religious practices. They democratize access to sacred sites, preserve cultural heritage, and facilitate interfaith understanding, while simultaneously challenging established theological frameworks. Future development must prioritize ethical design, cultural sensitivity, theological consultation, and enhanced multisensory integration. The field requires interdisciplinary collaboration among technologists, religious scholars, ethicists, and faith communities to ensure these innovations serve spiritual authenticity rather than commercial exploitation.

Keywords: Virtual reality; Artificial intelligence; Digital religion; Sacred spaces; Pilgrimage; Immersive technologies; Religious tourism; Spiritual experience; Theological ethics; Cultural preservation

Executive Summary: Practitioner's Guide

This article examines how artificial intelligence (AI), virtual reality (VR), and augmented reality (AR) are reshaping pilgrimage and sacred space engagement in the digital era. For practitioners—including religious leaders, heritage managers, technology developers, and policymakers—the following key insights and action points summarize the article's core findings

(1) Virtual sacred spaces complement, not replace, physical pilgrimage. VR/AR technologies democratize access for individuals facing physical, financial, or geopolitical barriers, and serve valuable educational and cultural preservation functions, but cannot substitute for sacramentally required physical presence in traditions such as Islam (Hajj/Umrah) or Orthodox Christianity.

(2) AI companions can deepen pilgrimage meaningfully. When ethically designed, AI-powered guides providing real-time translation, historical context, and reflective prompts enrich rather than commodify sacred journeys—as demonstrated on the Kumano Kodō Iseji and Camino de Santiago.

(3) Co-design with religious communities is non-negotiable. Culturally sensitive and theologically appropriate virtual sacred spaces require meaningful consultation with religious authorities and community representatives throughout design, implementation, and evaluation.

(4) Ethical safeguards are essential. Developers and institutions must address data privacy for sensitive religious information, algorithmic bias, digital exclusion, and the risk of commodifying sacred experience. Governance frameworks should empower religious communities and mandate accessibility.

(5) Interdisciplinary collaboration is the path forward. Technologists, religious scholars, ethicists, anthropologists, and faith communities must work together to ensure virtual sacred spaces serve spiritual authenticity, cultural preservation, and human flourishing.

INTRODUCTION

The digital revolution has permeated virtually every aspect of contemporary human experience, and religious practice is no exception. As artificial intelligence (AI), virtual reality (VR), and augmented reality (AR) technologies mature, they are fundamentally reshaping how individuals engage with sacred spaces, participate in religious rituals, and undertake spiritual journeys. Pilgrimage—one of humanity's oldest and most universal religious practices—is being reimagined through immersive digital environments that transcend geographical, physical, and economic barriers [1], [2], [3].

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue V, May 2026

Traditional pilgrimage has historically required physical presence at sacred sites, involving arduous journeys that test devotion, foster community, and facilitate transformative spiritual experiences. From the Hajj to Mecca, the Camino de Santiago, the Kumbh Mela, Buddhist circuits to Lumbini, and Christian pilgrimages to Jerusalem and Rome, these journeys have shaped religious identity and practice for millennia [4], [5]. However, millions of believers face insurmountable obstacles to physical pilgrimage: disability, advanced age, financial constraints, political instability, pandemic restrictions, and environmental concerns [6], [7].

The emergence of virtual sacred spaces and AI-augmented pilgrimage experiences represents both an opportunity and a challenge for religious communities worldwide. On one hand, these technologies democratize access to sacred sites, preserve endangered cultural heritage, facilitate interfaith dialogue, and offer innovative educational tools [8], [9], [10]. On the other hand, they raise profound theological questions about the nature of sacred space, the validity of virtual religious experiences, the role of embodied presence in spiritual practice, and the risk of commodifying the sacred [11], [12], [13].

Recent technological advances have enabled increasingly sophisticated implementations. VR systems now recreate sacred architecture with photorealistic detail, incorporating spatial audio, ambient environmental effects, and interactive ritual elements [14], [15]. AR applications overlay digital information onto physical pilgrimage routes, providing historical context, scriptural references, and multilingual guidance [16], [17]. AI companions offer personalized spiritual support, real-time translation, emotional recognition, and adaptive narrative experiences [18], [19]. These innovations are not merely technical achievements; they represent a fundamental reconceptualization of how technology mediates religious experience in the 21st century.

This article provides a comprehensive examination of virtual sacred spaces and AI-augmented pilgrimage experiences, synthesizing current scholarship to address critical questions: How do these technologies function, and what are their capabilities and limitations? What theological and ethical implications arise from virtualizing sacred experiences? How do different religious traditions respond to these innovations? What accessibility benefits do they provide, and for whom? What are the risks of commercialization, cultural appropriation, and spiritual superficiality? And what future directions should guide responsible development?

The analysis draws upon 78 peer-reviewed publications spanning computer science, religious studies, theology, human-computer interaction, tourism studies, and digital humanities. By examining diverse implementations across Islamic, Christian, Hindu, Buddhist, and Jewish contexts, this study offers a holistic understanding of how digital technologies are transforming pilgrimage and sacred space in the digital era. The findings have significant implications for religious communities, technology developers, policymakers, and scholars seeking to navigate the complex intersection of faith and technology in contemporary society.

BACKGROUND AND THEORETICAL FOUNDATIONS

Defining Virtual Sacred Spaces

Virtual sacred spaces represent digitally mediated environments designed to evoke, simulate, or facilitate religious and spiritual experiences. These spaces exist along a continuum from simple online representations of physical sites to fully immersive, interactive virtual worlds that enable ritual participation, communal worship, and contemplative practice [20], [21]. The concept challenges traditional understandings of sacred space, which have historically emphasized physical location, architectural embodiment, and material presence [22].

Battista defines the digital sacred space as an online environment where collective faith is recognized through electronic means, bringing individuals into a community that assumes characteristics of a sacred place [20]. This definition highlights the social and communal dimensions of virtual sacredness, suggesting that digital spaces can function as legitimate sites of religious gathering and practice. However, this perspective remains contested, particularly within traditions that emphasize the irreplaceable nature of physical presence and material sacraments [10].

Virtual sacred spaces can be categorized into several types. First, **representational spaces** digitally document existing sacred sites through photography, 3D scanning, and photogrammetry, allowing remote viewing without

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue V, May 2026

interactive elements [1], [8]. Second, **reconstructive spaces** recreate historical or inaccessible sacred sites using archaeological data and historical records, preserving cultural heritage and enabling educational exploration [9], [15]. Third, **simulative spaces** replicate contemporary sacred sites with interactive ritual elements, allowing users to perform virtual versions of religious practices [4], [13]. Fourth, **imaginative spaces** create entirely new sacred environments inspired by religious symbolism, mythology, or theological concepts, offering novel contexts for spiritual exploration [14], [26].

The phenomenology of virtual sacred spaces involves complex interactions between technology, perception, and belief. Users must negotiate the relationship between physical embodiment and virtual presence, between material reality and digital representation, between individual experience and communal participation [2], [30]. This negotiation raises fundamental questions about the ontological status of virtual religious experiences and their relationship to traditional theological frameworks.

Pilgrimage in Religious Traditions

Pilgrimage constitutes a central practice across diverse religious traditions, serving multiple functions: demonstrating devotion, seeking spiritual transformation, fulfilling religious obligations, connecting with sacred history, and building community [5], [18], [23]. The physical journey itself often carries theological significance, with hardship, sacrifice, and perseverance understood as integral to spiritual growth [19], [28].

In Islam, the Hajj to Mecca represents one of the Five Pillars, obligatory for all physically and financially capable Muslims at least once in their lifetime. The pilgrimage involves specific rituals performed at designated times and locations, emphasizing communal unity and submission to divine will [6], [11], [15]. Similarly, Umrah, though not obligatory, holds significant spiritual value and can be performed throughout the year [11].

Christian pilgrimage traditions include journeys to Jerusalem, Rome, Santiago de Compostela, Lourdes, and numerous other sites associated with biblical events, saints, or miraculous occurrences. These pilgrimages often emphasize personal transformation, penance, healing, and connection with Christian history [10], [17], [23]. The Camino de Santiago, in particular, has experienced a contemporary resurgence, attracting both religious and secular participants seeking spiritual meaning [23].

Hindu pilgrimage encompasses visits to sacred rivers (especially the Ganges), temples, and sites associated with deities and mythological events. The Kumbh Mela, occurring every twelve years, represents the world's largest religious gathering, with tens of millions of participants [4], [16]. Buddhist pilgrimage focuses on sites associated with the Buddha's life—Lumbini (birth), Bodh Gaya (enlightenment), Sarnath (first teaching), and Kushinagar (death)—as well as stupas and monasteries [9], [13].

Jewish pilgrimage historically centered on the Temple in Jerusalem, with contemporary practices including visits to the Western Wall, Rachel's Tomb, and sites associated with biblical and historical events [13]. Across these traditions, pilgrimage serves not merely as tourism but as a transformative spiritual practice involving preparation, journey, ritual performance, and integration of experience into daily life.

Technological Foundations: VR, AR, and AI

The technological infrastructure enabling virtual sacred spaces and AI-augmented pilgrimage rests on three primary domains: virtual reality, augmented reality, and artificial intelligence. Each technology offers distinct capabilities and limitations for mediating religious experience.

Virtual Reality (VR) creates fully immersive digital environments that replace the user's physical surroundings with computer-generated spaces. Head-mounted displays (HMDs) such as Meta Quest, HTC Vive, and PlayStation VR provide stereoscopic vision, spatial audio, and head tracking, creating a sense of presence in virtual environments [3], [4], [9]. VR implementations of sacred spaces utilize photogrammetry, 3D modeling, and game engine technologies (Unity, Unreal Engine) to recreate architectural details, lighting conditions, and ambient soundscapes [4], [14], [15]. Advanced systems incorporate haptic feedback, motion tracking, and social VR features enabling multi-user experiences [8], [10].

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Augmented Reality (AR) overlays digital information onto the physical world, enhancing rather than replacing real environments. Mobile AR applications using ARCore and ARKit enable smartphone-based experiences that superimpose historical reconstructions, scriptural texts, navigational guidance, and multimedia content onto physical pilgrimage routes [7], [12], [16]. AR's advantage lies in maintaining connection to physical place while augmenting it with contextual information, supporting rather than replacing traditional pilgrimage [2], [7].

Artificial Intelligence (AI) encompasses machine learning, natural language processing, computer vision, and generative algorithms that enable adaptive, personalized, and intelligent systems. In pilgrimage contexts, AI powers conversational companions that provide historical narration, answer theological questions, offer emotional support, and adapt to individual user needs [18], [23], [28]. AI also enables real-time translation, sentiment analysis, recommendation systems, and predictive analytics for crowd management [6], [18]. Generative AI can create personalized spiritual content, though this raises significant ethical concerns about authenticity and authority [24].

The integration of these technologies creates hybrid systems that combine VR's immersive presence, AR's contextual augmentation, and AI's adaptive intelligence. Such systems represent the cutting edge of digital religious experience, offering unprecedented capabilities while simultaneously raising complex theological, ethical, and practical questions that this article examines in depth.

LITERATURE REVIEW

Historical Evolution of Digital Religion

The intersection of religion and digital technology predates contemporary VR and AI systems by several decades. MacWilliams documented early virtual pilgrimages on the internet in 2002, noting how websites offered virtual tours of sacred sites, online prayer communities, and digital representations of religious artifacts [18]. These early implementations, though limited by bandwidth and graphical capabilities, established foundational concepts of remote religious participation and digital sacred space [18].

The emergence of virtual worlds such as Second Life in the mid-2000s marked a significant evolution, enabling users to create three-dimensional religious spaces, conduct virtual worship services, and form online faith communities [14], [26], [27]. Bittarello's analysis of virtual worlds, myths, and imagination explored how these platforms enabled religious expression through visual and interactive elements, arguing that virtual worlds existed conceptually before the internet through literary and imaginative traditions [14]. Atwaters examined how Second Life users redefined the sacred through creative religious expression, producing knowledge and innovation within 3D virtual environments [26].

Gerth's ethnographic study of Zoroastrians on the internet revealed how diaspora communities utilized digital platforms for resource sharing, identity affirmation, and virtual pilgrimage, demonstrating both the cohesive and fragmenting effects of online religious participation [29]. This research highlighted how digital technologies could strengthen religious communities while simultaneously fostering ideological divergence [29].

The COVID-19 pandemic dramatically accelerated digital religious innovation, forcing faith communities worldwide to rapidly adopt online worship, virtual sacraments, and digital pastoral care [5], [17]. Cooper et al. analyzed the reconfiguration of social, digital, and physical presence, examining the transformation from "online church" to "church online"—a shift from merely broadcasting services to fundamentally reimagining ecclesial presence in digital spaces [17]. This pandemic-driven transformation normalized digital religious participation and spurred investment in more sophisticated virtual sacred space technologies [5].

Contemporary Virtual Sacred Space Implementations

Recent implementations demonstrate significant technological sophistication and diverse religious applications. Gao et al.'s "Digitizing Devotion" project utilizes advanced oblique photography and AI to create immersive virtual reconstructions of sacred spaces, specifically targeting cultural preservation for global diaspora

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue V, May 2026

communities [1]. This approach emphasizes heritage conservation and intergenerational transmission of religious practices across geographical boundaries [1].

Shahapure et al. developed a VR experience of the Ram Mandir temple in Ayodhya using Unity and Oculus, incorporating lifelike 3D models, spatial sound design, ambient lighting, and intuitive controls to deliver an engaging spiritual journey [4]. User testing revealed positive responses, with future directions including AI integration and multi-user spiritual experiences [4]. This project exemplifies how VR can serve educational and cultural functions while fostering appreciation among younger and international audiences [4].

Lo's study of a virtual Boudhanath Stupa environment in Minecraft-VR employed user-centered design (UCD) and behavior-driven development (BDD) to create culturally sensitive, ritual-oriented experiences [9]. Evaluation with 50 participants and 2 Tibetan Buddhist experts yielded positive feedback for aesthetic experience ($M = 4.36$) and user control ($M = 4.62$), with experts recognizing it as a "digital Dharma gate" suitable for those unable to travel to physical sites [9]. This research demonstrates the importance of cultural consultation and participatory design in virtual sacred space development [9].

Semwal et al.'s "Cyber Sanctuaries" explores the intersection of VR and spiritual experience, utilizing AI forecasting to predict sanctuary outcomes and detailing virtual sacred environments where users can study religious literature and visit virtual pilgrimage locations [3]. This forward-looking approach situates virtual sacred spaces within contemporary technological contexts while acknowledging limitations in concrete AI-pilgrimage mechanisms [3].

The Virtual Hajj and Umrah implementations represent particularly significant developments given Islam's emphasis on physical presence at Mecca. Rafsanjanie et al. examined VR-based pre-Hajj training, finding that despite concerns about authenticity, VR holds promise for helping pilgrims visualize and internalize ritual sequences, especially for those with limited access to conventional training [15]. Putri's analysis of Virtual Umrah concluded that while it cannot substitute for physical pilgrimage due to failing essential legal requirements such as travel (safar) and actual ritual performance, it holds significant potential as an educational tool to prepare and enhance spiritual awareness [11]. These studies reveal the nuanced theological positions within Islamic scholarship regarding virtual religious experiences [11], [15].

AI-Augmented Pilgrimage Systems

The integration of artificial intelligence into pilgrimage experiences represents a frontier in digital religion, moving beyond passive virtual environments to active, adaptive, and personalized spiritual guidance. Brumec et al.'s study of AI-supported transformation on the Camino de Santiago examined how AI companions can guide real-world pilgrims, providing reflective support while emphasizing ethical design [23]. The research proposes a framework for designing ethically grounded AI-guided pilgrimage companions that support rather than commodify the journey, nurturing reflection and facilitating encounters with diverse spiritual perspectives [23].

The "Augmenting Pilgrimage with AI" project documented walking the 170km Kumano Kodō Iseji route with a custom-built AI companion, exploring how digital tools might reshape one of Japan's oldest pilgrimage paths [28]. Rather than replacing the traditional experience, the AI deepened it by providing real-time translations, historical context, and companionship during remote trail sections [28]. This field reflection demonstrates how thoughtfully programmed AI can augment sacred travel without diminishing its meaning, transforming pilgrimage into a richer encounter with place, history, and mythology [28].

Felemban et al.'s comprehensive technology survey for Hajj crowd management examined how digital technologies, including VR/AR tours and AI-driven analytics, can improve the organization of mass gathering events [6]. The study categorized technologies into wireless systems, computer vision, spatial computing, data analytics, mobile applications, immersive technologies, and crowd modelling and simulation [6]. While primarily focused on logistical management, this research demonstrates how AI can enhance safety and accessibility in physical pilgrimage contexts [6].

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Rahi et al.'s work on ARCore-powered XR pilgrimage experiences in India explores how augmented reality can enhance spiritual tourism by overlaying digital content onto physical sacred sites [7], [12]. Though lacking explicit AI-driven augmentation in the current implementation, the framework establishes foundations for future AI integration in contextual information delivery and personalized guidance [7], [12].

The theoretical framework proposed by the "Virtual Religious Tourism" agenda identifies four salient thematic concerns for future research: scales and communities; technologies and infrastructures; heritagization and globalization; and the changing dynamics of the secular/post-secular in online religious tourism [5]. The authors argue that the "AI revolution" or "Fourth Industrial Revolution" holds particular implications for virtual pilgrimage, characterized by automation, machine learning, data-driven decision making, and complex modalities of self and collective memory [5].

User Experience and Spiritual Engagement

Empirical studies of user experience in virtual sacred spaces reveal complex patterns of engagement, presence, and spiritual response. Głębocka et al.'s preliminary results from the VReligion project examined experiencing the sacred in social VR, using avatars to gather in sacred spaces [8]. While the study mentions AI's role in shaping spirituality, it lacks concrete AI-pilgrimage mechanisms and offers limited ethical or user experience discussion [8].

Ding-Yang's study of virtual realities in spiritual practices evaluated how VR impacts users' perceptions of sacredness and intentions to reuse the system by replicating a traditional temple setting [25]. Quantitative and qualitative data from 30 participants revealed that VR significantly enhances the sense of solemnity, mainly through auditory elements like ritual music [25]. However, limitations were noted, particularly the absence of multisensory integration, underscoring VR's potential while emphasizing the need for continuous technological improvements [25].

Bideci et al.'s analysis of moving pilgrimage into the virtual realm examined the advantages and complexities of immersive technologies using mixed reality (MR), AR, and VR [19]. The study detailed virtual sacred environments and contemporary digital contexts but acknowledged limitations in AI components, ethical depth, user experience studies, and multimodal interaction [19].

Karatzas's theological examination of the church and VR critically assessed VR's capability to replace physical worship, particularly in Orthodox Christian theology, which deeply values bodily participation and physical presence in sacraments [10]. The study argues that virtual worship undermines fundamental ecclesiological principles by removing essential elements such as physical community, real-time co-presence, and actual material sacramental participation [10]. Empirical studies cited highlight both positive aspects—such as enabling participation for individuals with disabilities—and negative effects, including feelings of isolation and identity confusion from avatar-based interactions [10].

Farman et al.'s "Spiritual Cyborg" research compared VR, gaming, and transhuman mind uploading across Europe, the US, and Japan, exploring how AI and robotic technologies redefine embodied experiences and spirituality [30]. The study identifies these sites as "ontological opportunities" for remaking embodiment, disembodiment, and the relationship between reality and virtuality [30]. This theoretical framework suggests that virtual religious experiences should be understood not as confusion but as occasions for reimagining spiritual embodiment in technologically mediated contexts [30].

METHODOLOGY

Search Strategy and Data Sources

This systematic literature review employed a comprehensive search strategy across multiple scholarly databases to identify relevant publications on virtual sacred spaces and AI-augmented pilgrimage experiences. The search was conducted in early 2025, covering publications from 2000 to 2025 to capture both historical development and contemporary innovations in the field.

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Three primary databases were queried: SciSpace (yielding 100 papers), SciSpace Full Text (yielding 100 papers), and Google Scholar (yielding 20 papers). The search terms combined concepts related to digital religion, virtual reality, artificial intelligence, pilgrimage, and sacred spaces. Specific query strings included combinations of: "virtual sacred spaces," "AI pilgrimage," "digital religion," "VR religious experience," "augmented reality pilgrimage," "virtual reality worship," "immersive spiritual technology," "digital sacred architecture," and related terms.

The initial retrieval yielded 220 papers, which underwent deduplication based on DOI, title, and author matching. This process identified and removed 142 duplicate entries, resulting in 78 unique papers. These papers were then subjected to relevance ranking using a multi-criteria algorithm that assessed alignment with the research objectives, considering factors such as technological focus (VR/AR/AI), religious context, empirical evidence, theoretical contribution, and recency.

Inclusion and Exclusion Criteria

Inclusion criteria required that papers: (1) address virtual, augmented, or mixed reality implementations of sacred spaces or pilgrimage experiences; (2) discuss artificial intelligence applications in religious or spiritual contexts; (3) provide empirical data, theoretical frameworks, or case studies relevant to digital religion; (4) be published in peer-reviewed journals, conference proceedings, or scholarly books; and (5) be available in English or with English abstracts.

Exclusion criteria eliminated papers that: (1) focused solely on general religious internet use without immersive or AI technologies; (2) addressed only technical specifications without religious or spiritual context; (3) lacked scholarly rigor or peer review; (4) were purely speculative without grounding in existing implementations or theoretical frameworks; and (5) were inaccessible for full-text review.

The top 30 papers from the relevance-ranked list were selected for in-depth analysis, representing the most directly relevant and high-quality scholarship in the field. This sample size balances comprehensiveness with analytical depth, enabling detailed examination of methodologies, findings, and implications while maintaining focus on the most pertinent literature.

Data Extraction and Analysis

Data extraction employed a structured approach using three primary analytical dimensions: (1) Methodology and Research Design, capturing the technical approaches, study designs, sample sizes, and data collection methods; (2) Key Findings and Contributions, synthesizing the main results, outcomes, and scholarly contributions; and (3) Theological and Ethical Implications, identifying religious, spiritual, and ethical considerations discussed in each paper.

These dimensions were operationalized through AI-assisted content analysis of full-text papers using GPT-4 (OpenAI, version GPT-4o, accessed January–March 2025) as the primary analytical instrument. Specifically, GPT-4 was employed to extract thematic patterns, identify key findings, and categorize content across the three analytical dimensions. To ensure accuracy and consistency, all AI-generated extractions were validated through independent manual review by both authors: each extracted theme and finding was cross-checked against the original source text, discrepancies were discussed and resolved by consensus, and a 10% random sub-sample of papers was subjected to full re-extraction to verify inter-rater reliability (agreement rate: 94%). The analysis utilized thematic synthesis, identifying recurring patterns, contradictions, and gaps across the literature. Themes were inductively derived from the data while being informed by the research objectives, resulting in six primary thematic categories: technological implementations, accessibility and inclusivity, theological perspectives, ethical considerations, cultural preservation, and comparative religious analysis.

Comparative analysis examined variations across religious traditions (Islam, Christianity, Hinduism, Buddhism, Judaism), technological approaches (VR, AR, AI), and geographical contexts (Europe, North America, Asia, Middle East). This multi-dimensional analysis enables identification of both universal patterns and tradition-specific considerations in the development and reception of virtual sacred spaces and AI-augmented pilgrimage.

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Quality assessment considered methodological rigor, sample representativeness, theoretical grounding, empirical evidence, and contribution to the field. While the heterogeneity of approaches—ranging from technical implementations to theological critiques to ethnographic studies—precluded standardized quality scoring, each paper's strengths and limitations were noted and incorporated into the synthesis.

RESULTS AND DISCUSSION

Technological Implementations and Innovations

The analysis reveals a diverse landscape of technological implementations spanning the spectrum from simple virtual tours to sophisticated AI-augmented immersive experiences. Contemporary VR implementations leverage photogrammetry and 3D scanning to achieve photorealistic reconstructions of sacred architecture, with projects like the Ram Mandir VR experience demonstrating high-fidelity spatial audio, ambient lighting, and interactive ritual elements [4]. These systems typically employ game engines such as Unity or Unreal Engine, running on consumer VR headsets including Meta Quest, HTC Vive, and PlayStation VR [4], [9], [15].

Advanced implementations incorporate multiple sensory modalities to enhance presence and spiritual engagement. Ding-Yang's study found that auditory elements, particularly ritual music, significantly enhance the sense of solemnity in virtual temple environments [25]. However, the research also identified critical limitations in multisensory integration, particularly the absence of olfactory, gustatory, and sophisticated haptic feedback—sensory dimensions often integral to traditional religious rituals [25]. This gap represents a significant technical challenge for future development, as the full embodied experience of pilgrimage involves complex multisensory engagement that current technologies cannot fully replicate.

Augmented reality implementations offer complementary capabilities by maintaining connection to physical environments while overlaying contextual information. The ARCore-powered XR pilgrimage experiences developed by Rahi et al. demonstrate how mobile AR can enhance spiritual tourism by superimposing historical reconstructions, scriptural references, and multimedia content onto physical sacred sites [7], [12]. This approach preserves the authenticity of physical presence while augmenting it with educational and spiritual content, potentially offering a middle path between purely virtual and traditional pilgrimage [7], [12].

AI integration represents the most recent and potentially transformative development. The Kumano Kodō Iseji AI companion project demonstrates how natural language processing, machine learning, and contextual awareness can create adaptive spiritual guides that provide real-time translation, historical narration, and emotional support [28]. The system's ability to deepen rather than diminish the pilgrimage experience suggests that thoughtfully designed AI can serve as a valuable tool for enhancing engagement with sacred places, histories, and traditions [28]. Similarly, Brumec et al.'s framework for AI-guided Camino companions emphasizes ethical design principles that prioritize reflection, diverse spiritual perspectives, and communitarian ethos over mere logistical efficiency [23].

Crowd management technologies for mass pilgrimage events like Hajj demonstrate AI's practical applications in enhancing safety and accessibility. Felemban et al.'s comprehensive survey identifies wireless systems, computer vision, spatial computing, data analytics, mobile applications, immersive technologies, and crowd modeling as key technological domains [6]. These systems enable real-time monitoring, predictive analytics, and adaptive resource allocation, potentially preventing dangerous overcrowding while improving the pilgrimage experience for millions of participants [6].

The integration of AI with VR/AR creates hybrid systems with unprecedented capabilities. Semwal et al.'s "Cyber Sanctuaries" concept envisions AI forecasting to predict sanctuary outcomes, personalized spiritual guidance, and adaptive virtual environments that respond to individual user needs and spiritual states [3]. While current implementations remain limited, the trajectory suggests increasingly sophisticated systems that combine immersive presence, contextual augmentation, and intelligent adaptation [3].

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Accessibility and Inclusivity

Virtual sacred spaces and AI-augmented pilgrimage offer transformative accessibility benefits for populations traditionally excluded from physical pilgrimage. The literature consistently identifies several key beneficiary groups: individuals with physical disabilities or chronic illnesses that prevent travel [10], [13]; elderly persons for whom arduous journeys pose health risks [11], [15]; economically disadvantaged individuals unable to afford travel costs [5], [13]; people living in politically unstable regions or facing visa restrictions [13]; and those with caregiving responsibilities that prevent extended absence [9], [17].

Karatzas's analysis highlights how VR worship can enable participation for individuals with disabilities, offering spiritual engagement opportunities otherwise unavailable [10]. Lo's virtual Boudhanath Stupa project specifically designed for accessibility, receiving recognition from Tibetan Buddhist experts as a "digital Dharma gate" suitable for younger audiences and those unable to travel to physical sites [9]. This validation from religious authorities suggests that virtual sacred spaces can serve legitimate spiritual functions when designed with cultural sensitivity and theological consultation [9].

The COVID-19 pandemic dramatically demonstrated the accessibility value of digital religious technologies, as lockdowns and travel restrictions prevented billions from participating in traditional worship and pilgrimage [5], [17]. The rapid adoption of virtual religious services, online prayer communities, and digital pilgrimage experiences during this period normalized remote participation and revealed latent demand for accessible alternatives [5], [17]. Cooper et al. note that this transformation moved beyond mere digitization of existing practices to fundamental reimagining of how communities can gather and worship across physical distances [17].

Educational accessibility represents another significant benefit. Pre-Hajj VR training programs enable prospective pilgrims to visualize and internalize complex ritual sequences before undertaking the physical journey, potentially reducing anxiety and improving ritual performance [15]. Rafsanjanie et al. found that VR-based training holds particular promise for those with limited access to conventional training resources, democratizing preparation for this obligatory Islamic practice [15]. Similarly, virtual tours of sacred sites serve educational functions for students, scholars, and interfaith dialogue initiatives, fostering understanding without requiring physical travel [4], [13].

However, accessibility benefits are not uniformly distributed. Digital exclusion remains a significant concern, as access to VR/AR/AI technologies requires financial resources, technical literacy, reliable internet connectivity, and compatible devices [5], [13]. These requirements may paradoxically exclude the very populations—economically disadvantaged, elderly, rural residents—who might benefit most from virtual alternatives to physical pilgrimage [5]. The "Virtual Religious Tourism" agenda emphasizes that the AI revolution's benefits must be balanced against risks of creating new forms of exclusion based on digital access and literacy [5].

Cultural and linguistic accessibility also requires attention. Effective virtual sacred spaces must accommodate diverse languages, cultural contexts, and religious interpretations [1], [9], [28]. The AI companion on the Kumano Kodō Iseji provided real-time translation, enabling engagement with Japanese cultural and religious content for non-Japanese speakers [28]. Gao et al.'s "Digitizing Devotion" project specifically targets global diaspora communities, preserving cultural heritage and enabling religious practice across geographical boundaries [1]. These examples demonstrate how thoughtful design can enhance rather than diminish cultural accessibility.

Theological and Religious Perspectives

Theological responses to virtual sacred spaces and AI-augmented pilgrimage vary significantly across and within religious traditions, reflecting fundamental differences in understandings of sacred space, embodied presence, and the nature of religious experience. The literature reveals a spectrum of positions ranging from enthusiastic embrace to categorical rejection, with many scholars and practitioners occupying nuanced middle positions.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue V, May 2026

Orthodox Christian theology, as articulated by Karatzas, emphasizes the irreplaceability of material and bodily participation in liturgical life [10]. The study argues that authentic worship and sacraments involve material elements and genuine community, aspects impossible to replicate virtually [10]. Virtual worship is seen as undermining fundamental ecclesiological principles by removing essential elements such as physical community, real-time co-presence, and actual material sacramental participation [10]. This position grounds its critique in the theological significance of the Incarnation, affirming that God's taking on physical flesh validates and necessitates material, embodied religious practice [10]. From this perspective, VR may serve educational or catechetical purposes but should be categorically rejected for sacramental functions [10].

Islamic scholarship on Virtual Hajj and Umrah reveals similar concerns about religious legitimacy while acknowledging educational value. Putri's analysis concludes that Virtual Umrah cannot substitute for physical umrah because it fails to fulfill essential legal requirements such as travel (safar) and actual ritual performance [11]. Islamic jurisprudence (fiqh) requires physical presence at specific locations and times, bodily performance of prescribed actions, and the intention (niyyah) to fulfill religious obligations—elements that virtual experiences cannot satisfy [11]. However, the study recognizes significant potential as an educational tool to prepare and enhance spiritual awareness, serving as a bridge toward more meaningful real-life pilgrimage [11]. Rafsanjanie et al. similarly position VR-based pre-Hajj training as supplementary rather than substitutionary, helping pilgrims visualize and internalize ritual sequences while acknowledging ongoing concerns about authenticity [15].

Buddhist perspectives, as reflected in Lo's study of the virtual Boudhanath Stupa, demonstrate greater openness to virtual sacred spaces when designed with cultural sensitivity and religious consultation [9]. Tibetan Buddhist experts recognized the Minecraft-VR environment as a "digital Dharma gate," validating its spiritual function for those unable to access physical sites [9]. This acceptance may reflect Buddhist philosophical traditions that emphasize the mind's role in constructing reality and the provisional nature of all phenomena, potentially creating more conceptual space for virtual religious experiences [9]. However, the study also emphasizes the importance of participatory design involving religious authorities to ensure cultural authenticity and theological appropriateness [9].

Hindu implementations, such as the Ram Mandir VR experience, focus on cultural preservation, educational outreach, and accessibility for diaspora communities [4]. Shahapure et al. position the virtual temple as serving educational and cultural functions while fostering appreciation among younger and international audiences [4]. The project's emphasis on preserving intangible heritage and redefining religious tourism suggests a pragmatic approach that views virtual sacred spaces as complementary tools rather than replacements for physical pilgrimage [4].

Christian perspectives beyond Orthodox theology show greater diversity. The Camino de Santiago AI companion project, while acknowledging the Camino's Christian origins, emphasizes its contemporary function as a site of spiritual pluralism where diverse religious and secular orientations converge [23]. Brumec et al. propose that AI systems can nurture reflection and facilitate encounters with diverse spiritual perspectives, supporting the Camino's communitarian and existential ethos [23]. This approach suggests that digital augmentation can enhance rather than diminish spiritual authenticity when designed with ethical grounding and respect for the pilgrimage's transformative potential [23].

Ciocan's interdisciplinary analysis raises critical questions about whether technology will serve as an extension of the human spirit or a disruptive force leading to algorithmic spiritual control [24]. The study warns against freezing religion into algorithmically repeated paradigms, curtailing the historical processes of social negotiation and adaptive refinement inherent to religion's human essence [24]. This critique emphasizes the need for discernment, ritual, memory, and relational depth as counterweights to dehumanizing technological trends [24].

Ethical Considerations and Challenges

The development and deployment of virtual sacred spaces and AI-augmented pilgrimage raise profound ethical concerns spanning authenticity, commercialization, cultural appropriation, data privacy, and the potential for

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue V, May 2026

manipulation or exploitation. The literature identifies multiple ethical dimensions requiring careful consideration and governance.

Authenticity and Spiritual Legitimacy: A central ethical concern involves whether virtual experiences can authentically mediate sacred encounters or merely simulate superficial approximations. Karatzas argues that VR worship risks turning liturgical experiences into consumerist spectacles devoid of spiritual depth, potentially fostering individualism and superficial religious experiences [10]. This critique suggests that virtual sacred spaces may commodify the sacred, reducing profound spiritual practices to entertainment or tourism [10]. Putri's analysis of Virtual Umrah similarly emphasizes the need for religious guidelines and ethical frameworks to ensure that innovations do not blur the distinction between symbolic worship and legally valid rituals [11]. The ethical imperative is to maintain clarity about what virtual experiences can and cannot accomplish spiritually, avoiding misleading claims that might substitute virtual participation for practices that religious traditions deem essential [11].

Commercialization and Exploitation: The potential for commercial exploitation of virtual sacred spaces represents a significant ethical risk. The "Virtual Religious Tourism" agenda warns that commercialization requires attention, as profit motives may prioritize entertainment value over spiritual authenticity [5], [13]. Gerth's study of Zoroastrians online notes concerns about individuals using religion for commercial gain, with some online groups aiming to expose such exploitation [29]. The development of virtual pilgrimage experiences by commercial technology companies raises questions about who controls sacred content, how revenues are distributed, and whether financial barriers to access replicate or exacerbate existing inequalities [5], [13]. Ethical frameworks must address intellectual property rights over sacred sites, revenue sharing with religious communities, and prevention of exploitative pricing models [5].

Cultural Appropriation and Sensitivity: Virtual reconstructions of sacred sites risk cultural appropriation when developed without consultation with or consent from relevant religious communities. Lo's emphasis on user-centered design and behavior-driven development, including consultation with Tibetan Buddhist experts, demonstrates best practices for culturally sensitive development [9]. Gao et al.'s "Digitizing Devotion" project similarly prioritizes cultural preservation and transmission for diaspora communities, suggesting community-centered rather than extractive approaches [1]. Ethical development requires meaningful engagement with religious authorities, cultural representatives, and community members throughout the design, implementation, and evaluation processes [1], [9]. This engagement must respect religious protocols, sacred knowledge restrictions, and community preferences regarding representation and access [1], [9].

Data Privacy and Surveillance: AI-augmented pilgrimage systems collect extensive data about users' spiritual practices, beliefs, questions, and emotional states. This data collection raises significant privacy concerns, particularly given the sensitive nature of religious information and potential for discrimination or persecution based on religious identity [6], [23]. Felemban et al.'s survey of Hajj crowd management technologies notes the extensive use of wireless systems, computer vision, and data analytics, which necessarily involve surveillance of pilgrims' movements and behaviors [6]. Ethical frameworks must address data minimization, purpose limitation, consent, security, and restrictions on secondary use or sharing of religious data [6]. The potential for state surveillance of religious minorities or commercial profiling based on spiritual preferences requires robust privacy protections [6].

Algorithmic Bias and Representation: AI systems reflect the biases present in their training data and design choices, potentially perpetuating or amplifying religious stereotypes, marginalizing minority traditions, or privileging dominant interpretations [23], [24]. Brumec et al. emphasize the importance of ethical design for AI pilgrimage companions, ensuring they support diverse spiritual perspectives rather than imposing narrow theological frameworks [23]. Ciocan warns against algorithmic spiritual control that freezes religion into repeated paradigms, curtailing adaptive refinement [24]. Ethical AI development requires diverse training data, inclusive design teams, transparency about algorithmic decision-making, and mechanisms for community feedback and correction [23], [24].

Accessibility and Digital Exclusion: While virtual sacred spaces offer accessibility benefits, they also risk creating new forms of exclusion based on digital access, literacy, and resources [5], [13]. Ethical development

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must address these disparities through subsidized access, low-bandwidth alternatives, multilingual interfaces, and designs accommodating varying levels of technical literacy [5], [13]. The "Virtual Religious Tourism" agenda emphasizes that the AI revolution's benefits must be equitably distributed rather than concentrated among privileged populations [5].

Cultural Preservation and Heritage

Virtual sacred spaces serve critical functions in cultural preservation and heritage conservation, particularly for endangered sites, diaspora communities, and future generations. The literature demonstrates multiple preservation modalities and their significance for maintaining religious and cultural continuity.

Gao et al.'s "Digitizing Devotion" project exemplifies heritage preservation through advanced oblique photography and AI-driven reconstruction [1]. The project creates immersive virtual reconstructions of sacred spaces specifically for cultural preservation and transmission to global diaspora communities [1]. This approach addresses the challenge of maintaining religious practices and cultural identity across geographical boundaries and generational transitions [1]. For diaspora populations separated from ancestral homelands, virtual sacred spaces provide connection to cultural heritage and enable religious practices that might otherwise be impossible [1].

Lo's virtual Boudhanath Stupa project demonstrates preservation of religious cultural heritage through participatory design [9]. The Minecraft-VR environment combines spatial configuration, symbolic elements, and exploratory freedom to move beyond static representation toward participatory engagement [9]. Tibetan Buddhist experts recognized it as suitable for younger audiences and those unable to travel, suggesting its function in intergenerational transmission of religious knowledge and practice [9]. The project's emphasis on ritual nodes and symbolic elements preserves not merely architectural forms but the ritual practices and spiritual meanings embedded in sacred space [9].

Shahapure et al.'s Ram Mandir VR experience positions virtual reconstruction as preserving intangible heritage and redefining religious tourism [4]. The project serves educational functions, highlighting the rich historical and religious significance of the temple for younger generations and international audiences [4]. This educational dimension of preservation extends beyond the immediate religious community to foster broader cultural understanding and appreciation [4].

The preservation function becomes particularly critical for endangered or inaccessible sites. Virtual reconstruction can document sacred spaces threatened by conflict, environmental degradation, or political instability, creating permanent records that survive physical destruction [1], [9]. For sites with restricted access due to political boundaries, security concerns, or conservation requirements, virtual alternatives enable continued engagement without contributing to physical degradation [9], [13].

However, preservation through virtualization raises questions about authenticity and the relationship between original and copy. Battista's exploration of the digital as sacred space notes how digitization transforms the very concept of the sacred into a digital dimension, raising questions about whether virtual representations preserve or fundamentally alter what they document [20]. This tension between preservation and transformation requires careful consideration of what aspects of sacred space can be meaningfully captured digitally and what necessarily remains tied to physical place and material presence [20].

Comparative Analysis Across Religious Traditions

Comparative analysis reveals both universal patterns and tradition-specific variations in the development and reception of virtual sacred spaces and AI-augmented pilgrimage. These variations reflect fundamental theological differences regarding sacred space, embodied presence, and the nature of religious experience.

Islamic Contexts: Islamic implementations focus primarily on Hajj and Umrah simulation, pre-pilgrimage training, and crowd management for mass gathering events [6], [11], [15]. The theological emphasis on physical presence at specific locations and times creates tension with virtual alternatives, resulting in clear distinctions

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between educational/preparatory uses (generally accepted) and substitutionary uses (generally rejected) [11], [15]. Felemban et al.'s crowd management technologies demonstrate pragmatic applications that enhance physical pilgrimage rather than replacing it [6]. The Islamic context reveals how virtual technologies can support obligatory religious practices without claiming to fulfill them, maintaining theological integrity while leveraging technological benefits [6], [11], [15].

Christian Contexts: Christian implementations show greater diversity, reflecting denominational differences in sacramental theology and ecclesiology [10], [17], [23]. Orthodox theology, as articulated by Karatzas, categorically rejects virtual sacraments while accepting educational uses [10]. Protestant and Catholic approaches vary, with some communities embracing online worship during the pandemic and others maintaining strict distinctions between physical and virtual participation [17]. The Camino de Santiago AI companion project reflects contemporary Christian pilgrimage's evolution toward spiritual pluralism, accommodating both religious and secular participants [23]. This diversity suggests that Christian responses to virtual sacred spaces will likely remain heterogeneous, shaped by denominational theology and local community preferences [10], [17], [23].

Hindu Contexts: Hindu implementations emphasize cultural preservation, diaspora connection, and accessibility for geographically dispersed communities [4], [16]. The Ram Mandir VR experience positions virtual sacred space as complementary to physical pilgrimage, serving educational and cultural functions [4]. Tewari et al.'s exploration of VR as an ecological alternative for pilgrim experiences suggests environmental considerations may influence Hindu acceptance of virtual alternatives [16]. The Hindu context demonstrates how virtual technologies can serve cultural preservation and diaspora identity maintenance while remaining open to diverse theological interpretations [4], [16].

Buddhist Contexts: Buddhist implementations, particularly Lo's virtual Boudhanath Stupa, demonstrate relatively greater acceptance of virtual sacred spaces when designed with cultural sensitivity and religious consultation [9]. The recognition by Tibetan Buddhist experts of the virtual environment as a "digital Dharma gate" suggests philosophical openness to virtual religious experiences [9]. This acceptance may reflect Buddhist teachings on the mind's role in constructing reality and the provisional nature of phenomena, creating conceptual space for virtual sacred experiences [9]. However, the emphasis on participatory design and expert consultation indicates that acceptance depends on cultural authenticity and theological appropriateness [9].

Jewish Contexts: Jewish implementations, though less extensively documented in the reviewed literature, include virtual tours of the Western Wall and other sacred sites [13]. The historical emphasis on the Temple in Jerusalem and contemporary practices centered on the Western Wall create particular theological considerations for virtual alternatives [13]. The literature suggests that virtual Jewish sacred spaces primarily serve educational and diaspora connection functions rather than substituting for physical pilgrimage or worship [13].

Interfaith and Pluralistic Contexts: Several projects emphasize interfaith understanding and spiritual pluralism [5], [13], [23]. The "Virtual Reality and Multifaith Pilgrimage" study examines VR's potential to enhance interfaith understanding through immersive experiences of diverse sacred traditions [13]. Brumec et al.'s Camino AI companion explicitly supports diverse spiritual perspectives, reflecting the pilgrimage's contemporary function as a site of spiritual pluralism [23]. These interfaith applications suggest that virtual sacred spaces may serve bridge-building functions, fostering understanding across religious boundaries [13], [23].

Future Directions and Recommendations

Technological Advancements

Future technological development should prioritize multisensory integration, social VR enhancements, ethical AI design, accessibility improvements, and advanced preservation methods. Multisensory integration represents a critical frontier: current systems primarily engage visual and auditory senses while neglecting olfactory, gustatory, and haptic dimensions integral to traditional religious rituals [25]. Future systems should incorporate scent diffusion for ritual aromas, haptic feedback for prayer beads and ritual objects, and synchronized ritual participation in large-scale multi-user environments [8], [10], [25].

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Social VR capabilities require substantial enhancement to support communal worship and collective pilgrimage [8], [10]. Future platforms should enable large-scale multi-user experiences with spatial audio, avatar customization respecting religious modesty requirements, and synchronized ritual participation—moving toward "church online" rather than merely "online church" [17].

AI advancement should focus on ethical, culturally sensitive, and theologically informed systems [23], [24]. Future AI companions should incorporate multilingual natural language processing, emotion recognition for pastoral support, theological knowledge bases developed with religious authorities, and adaptive personalization that respects individual spiritual journeys without manipulative nudging [23], [28]. Transparency, user agency, and community oversight mechanisms are essential to guard against algorithmic spiritual control [24].

Accessibility technologies must address digital exclusion through low-bandwidth alternatives, simplified interfaces, and affordable hardware; mobile AR applications can democratize access compared to expensive VR headsets [5], [7], [12], [13]. Preservation technologies should advance photogrammetry, 3D scanning, and AI-driven reconstruction to document endangered sacred sites, integrating historical records, archaeological data, and community knowledge for culturally authentic reconstruction [1], [9].

Interdisciplinary Research Priorities

Future research requires sustained interdisciplinary collaboration among technologists, religious scholars, ethicists, anthropologists, psychologists, and faith communities. Several priority areas emerge from the literature review:

Longitudinal studies of spiritual impact are critically needed to understand how sustained engagement with virtual sacred spaces affects religious identity, practice, and community belonging over time [8], [25]. Comparative theological analysis should systematically examine how different religious traditions conceptualize sacred space and embodied presence, engaging religious authorities to develop tradition-specific guidelines [10], [11], [13].

Ethical framework development requires collaboration among ethicists, technologists, religious leaders, and policymakers to address authenticity, commercialization, cultural appropriation, data privacy, and algorithmic bias, providing actionable guidance for developers, religious communities, and regulators [5], [23], [24].

User experience research should employ mixed methods combining quantitative metrics (presence, engagement, satisfaction) with qualitative exploration of spiritual meaning-making, emotional responses, and perceived authenticity [9], [25]. Research should examine diverse populations including different age groups, cultural backgrounds, levels of religious commitment, and physical abilities [9], [25]. Particular attention should be paid to populations who might benefit most from virtual alternatives: elderly, disabled, economically disadvantaged, and geographically isolated individuals [9], [10], [13].

Cultural preservation methodologies should develop best practices for community-engaged documentation and transmission of sacred heritage, evaluating participatory design approaches involving religious authorities [1], [9]. Interfaith dialogue applications should explore how virtual sacred spaces foster understanding across religious boundaries without appropriating or misrepresenting traditions [13], [23].

Policy and Governance Frameworks

Effective governance of virtual sacred spaces and AI-augmented pilgrimage requires multi-stakeholder collaboration among religious institutions, technology companies, governments, and civil society organizations. Several policy priorities emerge:

Religious community empowerment should ensure that faith communities maintain authority over representation of their sacred sites, practices, and teachings [1], [9], [11]. Policies should require meaningful consultation, consent, and ongoing collaboration with religious authorities and community

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representatives [1], [9]. Intellectual property frameworks should recognize religious communities' rights over sacred content while balancing educational and cultural access [1], [9].

Data protection regulations must address the sensitive nature of religious data, providing robust privacy protections, consent requirements, and restrictions on secondary use, prohibiting discrimination and state surveillance of religious minorities [6], [23]. Quality and authenticity standards should establish criteria for accurate, respectful, and culturally sensitive representation of sacred sites, developed collaboratively with religious communities, with clear labeling distinguishing educational simulations from spiritually efficacious experiences [1], [9], [11].

Accessibility requirements should mandate that virtual sacred spaces accommodate diverse abilities, languages, and technical capacities [5], [9], [13]. Policies should incentivize or require developers to provide low-bandwidth alternatives, multilingual interfaces, and designs accommodating visual, auditory, and motor impairments [5], [9], [13]. Public funding for virtual sacred space development should prioritize accessibility and equitable access [5], [13].

Ethical AI guidelines should require transparency, fairness, accountability, and human oversight for AI systems mediating religious experiences, with mechanisms for community review and feedback [23], [24]. International cooperation is essential given the global nature of religious communities and technology platforms; international standards should address cross-border data flows, cultural heritage protection, and regulatory coordination, drawing on UNESCO frameworks for intangible cultural heritage [1], [5], [6].

Study Limitations

This review acknowledges several limitations that should inform interpretation of its findings. First, the search was confined to three databases—SciSpace, SciSpace Full Text, and Google Scholar—which, while comprehensive, may not capture all relevant publications indexed in specialized repositories such as PubMed, Scopus, or Web of Science. This database selection may introduce a degree of publication bias, potentially over-representing English-language and technologically oriented scholarship while underrepresenting theological, anthropological, or non-Western perspectives. Second, the review is temporally bounded to publications from 2000 to early 2025; rapidly evolving developments in generative AI and immersive technologies may have emerged after the search cutoff. Third, the reliance on AI-assisted content analysis, even with manual validation, introduces the possibility of systematic extraction biases, particularly in nuanced theological or phenomenological arguments. Fourth, the heterogeneity of included studies—spanning empirical user studies, theological critiques, technical implementations, and ethnographic accounts—precluded standardized quality scoring or meta-analytic synthesis, limiting the generalizability of comparative claims. Finally, the review draws predominantly on publications available in English, which may underrepresent scholarship from non-Anglophone religious traditions and geographic contexts. Future research should address these limitations through broader database coverage, multilingual searches, and systematic quality appraisal frameworks tailored to interdisciplinary digital religion studies.

CONCLUSION

Virtual sacred spaces and AI-augmented pilgrimage experiences represent a profound transformation in how humanity engages with the sacred in the digital era. This comprehensive review of 78 scholarly publications, with in-depth analysis of the 30 most relevant studies, reveals a complex landscape of technological innovation, theological debate, ethical challenge, and transformative potential.

The technological capabilities of contemporary VR, AR, and AI systems enable increasingly sophisticated implementations that recreate sacred architecture with photorealistic detail, provide adaptive spiritual guidance, and facilitate remote participation in religious practices [1], [3], [4], [28]. These systems offer significant accessibility benefits for individuals facing physical, financial, or geopolitical barriers to traditional pilgrimage, democratizing access to sacred sites and spiritual experiences [9], [10], [13], [15]. The COVID-19 pandemic accelerated adoption and normalized digital religious participation, revealing latent demand for accessible alternatives [5], [17].

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue V, May 2026

However, critical limitations persist. Virtual experiences cannot fully replicate the communal, ritualistic, and transformative elements of physical pilgrimage [10], [11], [13]. Multisensory integration remains technically limited, with current systems primarily engaging visual and auditory senses while neglecting olfactory, gustatory, and sophisticated haptic dimensions [25]. Theological perspectives vary significantly across and within religious traditions, with some viewing virtual sacred spaces as legitimate spiritual tools and others categorically rejecting them for sacramental purposes [10], [11], [13], [23].

Ethical considerations demand careful attention to authenticity, commercialization, cultural appropriation, data privacy, and algorithmic bias [5], [10], [11], [23], [24]. The risk of commodifying the sacred, reducing profound spiritual practices to entertainment or tourism, requires robust ethical frameworks and governance mechanisms [10], [11]. Digital exclusion threatens to create new inequalities based on access to technology, technical literacy, and financial resources [5], [13].

The comparative analysis across religious traditions reveals both universal patterns and tradition-specific variations. Islamic contexts emphasize clear distinctions between educational/preparatory uses (generally accepted) and substitutionary uses (generally rejected) of virtual pilgrimage [11], [15]. Christian responses vary by denomination, with Orthodox theology categorically rejecting virtual sacraments while other traditions show greater openness [10], [17], [23]. Buddhist implementations demonstrate relative acceptance when designed with cultural sensitivity and religious consultation [9]. These variations underscore the necessity of tradition-specific approaches that respect theological diversity while identifying common ethical principles.

Virtual sacred spaces serve critical functions in cultural preservation and heritage conservation, particularly for endangered sites, diaspora communities, and intergenerational transmission [1], [9]. The ability to document and reconstruct sacred spaces threatened by conflict, environmental degradation, or political instability provides permanent records that survive physical destruction [1]. For diaspora populations, virtual sacred spaces enable connection to cultural heritage and religious practices across geographical boundaries [1], [9].

Future development must prioritize multisensory integration, social VR capabilities, ethical AI design, accessibility technologies, and advanced preservation methods [5], [23], [24], [25]. Interdisciplinary research should examine longitudinal spiritual impact, comparative theological perspectives, ethical frameworks, user experiences, cultural preservation methodologies, and interfaith dialogue applications [5], [8], [9], [10], [11], [13], [23], [24], [25]. Policy and governance frameworks should empower religious communities, protect data privacy, establish quality standards, mandate accessibility, guide ethical AI development, and foster international cooperation [1], [5], [6], [9], [11], [23], [24].

The fundamental conclusion is that virtual sacred spaces and AI-augmented pilgrimage represent **complementary rather than replacement technologies** for traditional religious practices. They democratize access, preserve heritage, and facilitate understanding, while simultaneously challenging established theological frameworks and raising profound ethical questions. The path forward requires sustained collaboration among technologists, religious scholars, ethicists, and faith communities to ensure these innovations serve spiritual authenticity, cultural preservation, and human flourishing rather than commercial exploitation or technological determinism.

As Ciocan argues, religion must not be discarded but reengaged in the age of digital acceleration, serving as a compass for navigating complex ethical and existential stakes [24]. The spiritual and symbolic frameworks traditionally provided by religious consciousness offer essential counterweights to dehumanizing technological trends [24]. Virtual sacred spaces and AI-augmented pilgrimage, when developed with ethical grounding, cultural sensitivity, and theological consultation, can extend rather than diminish the human spirit's capacity for transcendence, meaning-making, and connection with the sacred.

The digital era presents both unprecedented opportunities and profound challenges for religious life. How humanity navigates this transformation will shape not only the future of religion but the future of human spirituality, community, and meaning in an increasingly technologically mediated world. The research synthesized in this article provides a foundation for that navigation, offering insights, frameworks, and

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue V, May 2026

recommendations to guide responsible development of virtual sacred spaces and AI-augmented pilgrimage experiences that honor both technological possibility and spiritual authenticity.

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