Chapter 11
Implementing AI in Heritage Tourism:
Balancing Access and Preservation

G. SudhaAnanthi
https://orcid.org/0009-0001-5062-5311
Winners Academy, India

T. C. Manjunath
https://orcid.org/0000-0003-2545-9160
Rajarajeswari College of Engineering, Bengaluru

Pankaj Singh Chandel
https://orcid.org/0000-0002-4135-8194
AAFT University of Media and Arts, India

ABSTRACT

Cultural heritage represents the cumulative legacy of human creativity, history, and identity, encompassing tangible artifacts such as monuments, museums, archaeological sites, and historical architecture, as well as intangible elements like traditions, rituals, and folklore. Preserving and promoting heritage while ensuring broad accessibility is a significant challenge in an increasingly globalized and digital world. Physical visits are often constrained by geographic distance, travel costs, physical mobility limitations, and environmental or socio-political factors. (Ayeh et al., 2013). AI-powered virtual tours for remote heritage access offer a transformative approach, combining artificial intelligence, 3D modeling, immersive media, and adaptive learning technologies to enable interactive, personalized, and highly engaging cultural experiences for audiences worldwide. These systems democratize

DOI: 10.4018/979-8-3373-8197-8.ch011

access to heritage, enhance educational outcomes, foster cultural appreciation, and support sustainable tourism while minimizing environmental impact on fragile heritage sites.

INTRODUCTION OF IMPLEMENTING AI IN HERITAGE TOURISM

Cultural heritage represents the cumulative legacy of human creativity, history, and identity, encompassing tangible artifacts such as monuments, museums, archaeological sites, and historical architecture, as well as intangible elements like traditions, rituals, and folklore. Preserving and promoting heritage while ensuring broad accessibility is a significant challenge in an increasingly globalized and digital world. Physical visits are often constrained by geographic distance, travel costs, physical mobility limitations, and environmental or socio-political factors. (Ayeh et al., 2013). AI-powered virtual tours for remote heritage access offer a transformative approach, combining artificial intelligence, 3D modeling, immersive media, and adaptive learning technologies to enable interactive, personalized, and highly engaging cultural experiences for audiences worldwide. These systems democratize access to heritage, enhance educational outcomes, foster cultural appreciation, and support sustainable tourism while minimizing environmental impact on fragile heritage sites.The foundational principle of AI-powered virtual heritage tours is the creation of interactive, intelligent, and immersive experiences that replicate or augment in-person visits. High-fidelity 3D reconstructions, photogrammetry, LiDAR scanning, and drone imagery capture the physical attributes of heritage sites, including architectural details, textures, spatial layouts, and contextual surroundings. AI algorithms, particularly computer vision models, enhance these reconstructions by filling gaps, restoring damaged areas, and optimizing visual fidelity. Natural language processing (NLP) and generative AI enable dynamic narration, multilingual explanations, and context-sensitive storytelling, ensuring that users receive tailored information based on their interests, cultural background, or educational level. By combining immersive visualization with intelligent interaction, AI-powered virtual tours replicate the richness of on-site experiences while providing unique functionalities not possible in physical visits, such as time-lapse reconstructions, archaeological layer visualization, or interactive annotations.

Data acquisition and integration are crucial to developing AI-powered virtual tours. Digital archives, historical photographs, architectural plans, archaeological records, GIS data, and contemporary imaging are synthesized to generate comprehensive digital representations of heritage sites. Environmental context data, such as geographic, climatic, and urban development information, provide additional layers of situational awareness, helping users understand the heritage in its historical