Chapter 4
Enhancing Cultural Heritage Documentation with AI and Computer Vision

Usharani Bhimavarapu
https://orcid.org/0000-0002-0246-1420
Department of Computer Science and Engineering, Koneru Lakshmaiah Education Foundation, Vaddeswaram, India

ABSTRACT

Digital Tools for Indigenous Knowledge Management is an important project for the conservation of material cultural heritage by leveraging advanced computational techniques. This paper's research is focused on data collection, preprocessing, and analysis from heritage monuments, sculptures, and buildings in Andhra Pradesh. Data preprocessing includes cleaning, normalization, and geospatial validation to render it accurate, followed by feature selection via Ant Colony Optimization (ACO) to determine the most significant features. An improved ResNet model is utilized for classification and analysis of high-resolution images and metadata to enhance heritage documentation. Further, digital application integration such as augmented reality (AR), virtual reality (VR), and geographic information systems (GIS) enables interactive discovery of heritage and sharing of knowledge. The proposed methodology strengthens the bond of cultural heritage conservation with the aid of Indigenous knowledge through innovative digital platforms.

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INTRODUCTION

Indigenous knowledge is cultural heritage encompassing customs, language, practices, and objects that define a people. In the rush for globalization, there is a necessity to record, preserve, and market indigenous heritage using available digital technologies. There are digital technologies including artificial intelligence, GIS mapping, and cloud storage that provide good means of conducting and preserving cultural information. Particularly, indigenous oral tradition, historical sites, and artifacts are digitized and immortalized. Mobile applications and virtual reality interfaces further open up access to cultural heritage. Government and research institutions directly fund digitization projects for consumption by the indigenous groups. Artificial intelligence drives automatic restoration and classification of historic documents and objects. Blockchain assists in secure protection and storing away indigenous knowledge repository in an impenetrable form. Collaboration with indigenous groups guarantees ethical collection and archival measures. Computer technology offers a sustainably renewable means of keeping indigenous knowledge in store for future generations.

Digitization and archiving archives is one of the most critical applications of computer technologies for handling indigenous knowledge. Indigenous groups have vast resources of historical information, oral traditions, and artifacts that can perish through ecological devastation or documentation abandonment. High-resolution scanning and digital repositories provide a platform for access and storage for such content globally. Cloud storage technology allows communities to store information securely without compromising on control or access. Virtual libraries through AI-based search capacities extend native access to indigenous information. Optical Character Recognition technologies facilitate the digitization of inscriptions and manuscripts from handwriting. Machine learning facility is able to classify and sort enormous amounts of data to make them readable. Augmented reality (AR) applications animate monuments through interactive digital overlays. Local language processing programs assist in keeping local knowledge local language. Through digital means used as a system, cultural heritage can be maintained and retrieved with greater accuracy and reliability.

Geographic Information System mapping and geospatial technology are to have a key function in indigenous heritage protection and preservation. Indigenous knowledge systems have close relations with the geographical location in particular where they are found, e.g., ancient towns, former hunting grounds, and sacred sites. GIS aid in establishing the position by precise coordinates to enable these captured and preserved suitably. Superimposition of historical data on current satellite images helps scientists track landscape change and boundary definition of conservation plans. Digital storytelling is also enabled through the implementation of GIS tech-