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Computational Analysis and Recognition of Manipuri Traditional Motifs

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Abstract

The traditional textile motifs represent an invaluable component of the cultural heritage, preserving the artistic identity, historical narratives and the indigenous knowledge systems of a particular region. In Northeast India, Manipuri traditional dress motifs hold an exceptional cultural significance and are also deeply embedded in the garments such as Innaphi, Phanek and ceremonial textiles. These motifs had exhibit intricate geometric, floral and script-inspired structures that are produced through a labour intensive manual weaving and embroidery techniques. However, due to the lack of systematic digital documentation and the automated analysis poses a serious threat to their long-term preservation. With the rapid advancement of computer vision and artificial intelligence, particularly deep learning, automated recognition of textile motifs has emerged as a promising research domain within cultural heritage informatics. This paper presents a comprehensive and systematic review of the computational techniques employed for the textile and motif pattern recognition with a focused that emphasis on the Manipuri traditional motifs such as Khamen Chatpa, Namthang Khuthat, Thambal Cheplei and Ningkham Mayek patterns. The paper critically analyses the handcrafted feature extraction methods, the convolutional neural network (CNN) based models, lightweight deep learning architectures and the emerging transformer-based vision models. Furthermore, the importance of a curated and annotated datasets tailored to Manipuri motifs is highlighted in this paper. This survey provides the first consolidated review focused specifically on Manipuri traditional motifs and highlights future research directions for culturally informed AI systems. Various key challenges, unresolved research gaps and the potential future directions are also discussed to guide the development of robust recognition frameworks and support the sustainable digital preservation of the Manipuri textile heritage.

Keywords: Manipuri Traditional Motifs, Pattern Recognition, Computer Vision, Deep Learning, Cultural Heritage Digitization, Machine Learning

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