



Special Issue - Innovative Commerce: Bridging Business and Computer Applications (ICBBCA-2026)

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DIGITAL ANALYSIS OF TAMIL-BRAHMI INSCRIPTIONS USING MACHINE LEARNING

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Abstract

Tamil-Brahmi inscriptions are among the earliest records of the Tamil language, dating from the 3rd century BCE to the 4th century CE. These inscriptions appear on rocks, caves, pottery, and coins across South India and Sri Lanka. Due to erosion and variations in writing styles, manual interpretation is difficult. Automated recognition systems using image processing and machine learning help identify characters and interpret inscriptions more efficiently. These technologies support digital preservation, archaeological research, linguistic studies, and cultural heritage conservation.

Keywords: Tamil-Brahmi, Image Processing, Machine Learning, Optical Character Recognition, Epigraphy

Introduction

Many inscriptions written in this script have been discovered in TamilNadu and nearby regions.

These inscriptions provide important information about ancient Tamil culture, religion, and trade. However, many inscriptions are damaged due to weathering, making manual interpretation challenging. Modern technologies such as computer vision and machine learning enable automated recognition of inscription characters from images. These systems assist researchers in analyzing ancient texts more quickly and accurately.

Review of Literature

➤ Iravatham Mahadevan conducted important studies on Tamil-Brahmi inscriptions and documented many early Tamil epigraphic records. His research helped scholars understand the structure and historical development of the Tamil-Brahmi script.



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➤ Later studies by K. Rajan focused on the archaeological importance of Tamil-Brahmi inscriptions in understanding ancient Tamil culture and society. Recent research has also explored the use of image processing and machine learning techniques to automate the recognition and interpretation of ancient inscriptions. These technologies help improve the analysis and preservation of historical texts.

Digital Preservation of Inscriptions

One of the most important applications of automated recognition systems is the digital preservation of ancient inscriptions. Many Tamil-Brahmi inscriptions are carved on rock surfaces that are exposed to natural environmental conditions. Over time, rain, wind, and temperature changes cause the inscriptions to fade or become damaged.

High-resolution imaging combined with automated recognition techniques allows researchers to capture and store digital copies of inscriptions. Image processing algorithms enhance the visibility of characters and help recover faded details.

Digital archives created using these technologies ensure that the historical information contained in inscriptions is preserved permanently. Researchers can access these digital records from anywhere in the world, making it easier to study and analyze ancient texts.

Archaeological Documentation

Automated recognition systems also support archaeological documentation. When archaeologists discover new inscriptions, they must record and analyze them accurately. Automated systems help identify individual characters from inscription images and classify them based on known Tamil-Brahmi patterns. Machine learning algorithms can compare newly discovered inscriptions with existing datasets. This helps archaeologists identify similarities in writing styles and determine the historical period of the inscription. Automated documentation tools also help create organized databases containing images, recognized characters, translations, and metadata

Linguistic Research

Tamil-Brahmi inscriptions are valuable resources for studying the early development of the Tamil language. Linguists analyze these inscriptions to understand phonetic patterns, vocabulary, and grammatical structures used in ancient Tamil.

Computational tools also assist in reconstructing incomplete words by analyzing linguistic context and patterns. This improves the accuracy of interpretation and provides deeper insights into the development of the Tamil language.



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Cultural Heritage Conservation

Tamil-Brahmi inscriptions are important cultural heritage artifacts that reflect the history and traditions of early Tamil civilization. Automated recognition technologies support heritage conservation by creating detailed digital records of inscriptions. Image enhancement techniques can restore faded characters and reconstruct damaged sections of inscriptions. These digital reconstructions help historians understand incomplete texts and preserve their historical value. Heritage organizations can also use automated monitoring systems to track the condition of inscription sites.

Educational Applications

Automated inscription recognition systems can be used as educational tools for students studying history, archaeology, linguistics, and Tamil literature. Digital platforms can display images of Tamil-Brahmi inscriptions along with recognized characters and translations. Educational applications also promote awareness of ancient Tamil heritage among younger generations.

Conclusion

Automated recognition and interpretation of Tamil-Brahmi inscriptions represent an important intersection of technology and historical research. By applying image processing, machine learning, and artificial intelligence, researchers can

analyze ancient scripts more efficiently and accurately.

The applications of automated recognition systems include digital preservation, archaeological documentation, linguistic research, cultural heritage conservation, education, and tourism. These technologies not only support academic research but also help preserve and promote the rich historical heritage of the Tamil language.

Future Advancements

In artificial intelligence and deep learning are expected to further improve recognition accuracy and expand the capabilities of automated inscription analysis systems.

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