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# Inscription Identifier: Unveiling Ancient Language Characters through Contour-Let Transform and Font Recognition

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**Abstract:**

Ancient language characters are different from current century's ancient language character. Ancient language Recognition of ancient language hand written characters from inscriptions is difficult. Font Recognition is one of the Challenging tasks in Optical Character Recognition and Document Analysis. Most of the existing methods are for font recognition make use of local typographical features and connected component analysis. The aim of the project is to develop and identify ancient language characters and converting them into current century's form using Deep Learning. In this project, Ancient language font recognition is done based on global texture analysis and a method for recognizing Ancient language characters from stone inscriptions, called the contour-let transform is used. The contour-let transform offers a solution to remedy to this insufficiency. Convolutional Neural networks are being employed to train the image and compare the data with the current century's character hence a more accurate recognition of Ancient language characters from stone inscriptions is obtained. Character Mapping algorithm is proposed to convert the recognized ancient language characters into their current century's form. The proposed approach of integrating global texture analysis, the contour-let transform, deep learning, and character mapping aims to enhance the accuracy of recognizing and transforming ancient language characters. The system's performance is evaluated using appropriate metrics, with iterative optimization undertaken to refine the model and algorithms, ensuring a robust and effective solution to the intricate task at hand.

## 1. Introduction

Inscriptions are invaluable historical records that offer deep insights into the cultural, political, and linguistic heritage of ancient civilizations. Unlike manuscripts, inscriptions engraved on stone, metal, and other durable materials are resistant to tampering and natural degradation, making them reliable sources of information. These inscriptions, often found on rocks, pillars, and temple walls, document royal decrees, religious practices, donations, and other significant events. In India, over 100,000 inscriptions have been discovered, each contributing to our understanding of dynastic histories, early scripts, and social structures. However, interpreting these inscriptions is a complex task due to the diversity of languages, scripts, and their often weathered condition. This project addresses these challenges by leveraging advanced deep learning and image processing techniques to automatically recognize and translate ancient characters into their modern counterparts. By developing a system that can accurately analyze inscription images and determine their historical context, this work aims to support researchers and historians in preserving and understanding ancient linguistic records.

## 2. Realated work

Several researchers have explored the problem of recognizing ancient scripts and characters using various image processing and machine learning techniques. This section reviews the relevant literature across three main domains: ancient character recognition, transform-based feature extraction, and font/style recognition.

## 3. Methodolohy

### 3.1 System Architecture

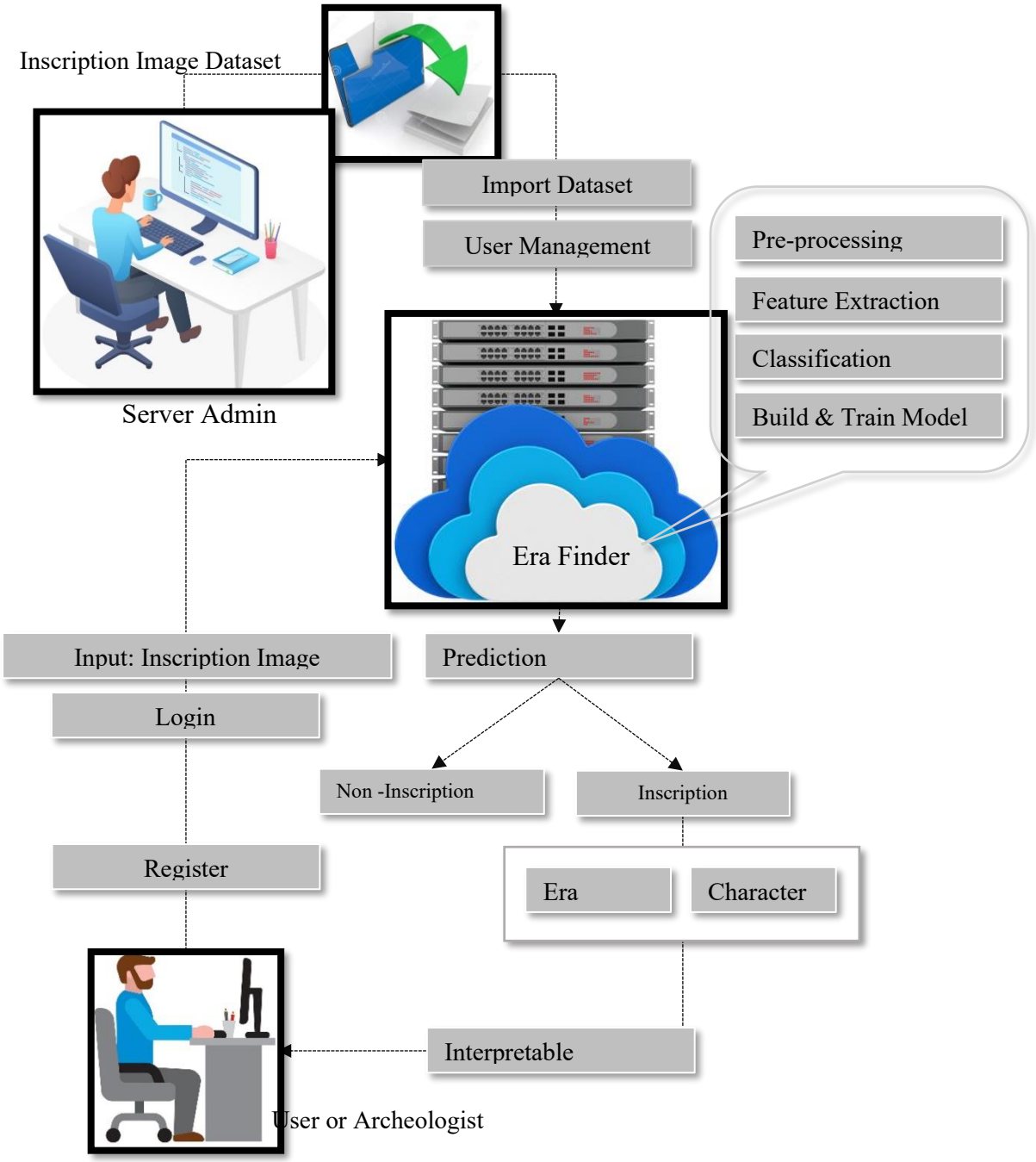


**Figure 1:** System Architecture

### 3.2 Modules

**Virtual HR Web App**

The Virtual HR Web App is developed using Python, Flask, MySQL, and Bootstrap, enabling candidates to register, upload resumes, and engage in the recruitment process seamlessly

**Model Name: InsNet**

The proposed model is named **InsNet**, specifically designed for recognizing ancient inscription characters and predicting their corresponding historical era. It is a deep learning-based Convolutional Neural Network (CNN) tailored for image classification tasks. InsNet is trained on ancient inscription datasets and optimized for high accuracy and reliability.

**Architecture Overview**

InsNet follows a multi-layered CNN architecture that includes convolutional layers for feature extraction, pooling layers for dimensionality reduction, and fully connected layers for classification. The model processes 640x640 preprocessed images and outputs predictions for both character recognition and century classification. The architecture balances depth and performance to handle noise and distortion in ancient scripts

**Character Recognition Submodel**

This submodel identifies individual characters segmented from the inscription image. It classifies each character using CNN layers trained with annotated examples of ancient scripts such as Brahmi or Tamil. The result is a label with a confidence score representing the most likely ancient character.

**Century/Era Classification Submodel**

Along with character recognition, the model predicts the **era** to which the inscription belongs, such as the Gupta or Chola period. This is done using a fully connected output layer that maps features to a predefined set of centuries. It helps researchers contextualize inscriptions historically.

**Character Mapping Module**

Once characters are identified, they are translated into their **modern equivalents** using a mapping algorithm. This algorithm uses a lookup table or rule-based logic to map each recognized ancient character to its current form. This step enhances readability and understanding of ancient texts.

## 4.Experimental Results

4.1 **implementation Environment**

**Languages/Tools:** Ancient Inscriptions, Optical Character Recognition (OCR), Contour-Let Transform, Convolutional Neural Network (CNN), Deep Learning, Character Mapping, Image Processing, InsNet Model, Historical Linguistics, Flask Web Application

Hardware: Intel Core Duo 2.0 GHz or higher **Software:** Visual studio code + browser

4.2 results

The developed system effectively recognized ancient language characters from stone inscriptions using deep learning and image processing techniques. By employing contour-let transform for feature extraction and CNN for classification, the model achieved high accuracy in character recognition and era prediction. Testing showed successful outcomes across various historical datasets, with accurate mapping of ancient characters to their modern forms. The user-friendly web interface enabled easy image upload and result visualization. Although minor issues occurred with rare or degraded characters, overall system performance was robust, demonstrating its potential to assist researchers in analyzing and interpreting ancient inscriptions efficiently.


**Figure 2:** Candidate registration portal for verification Training Phase interface of the Inscription Detector web app, displaying preprocessed grayscale inscription images after RGB to Gray conversion.

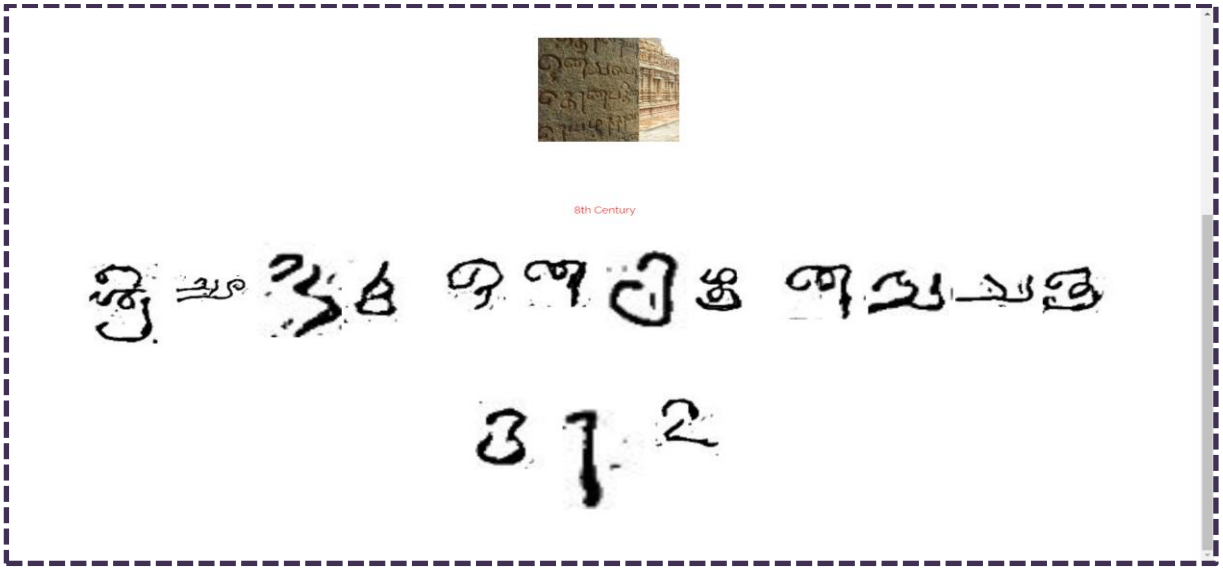


**Figure 3:** recognized and segmented ancient inscription characters extracted from a stone , with each character individually highlighted and processed for mapping to their modern equivalents

## 5.Conclusion and future work

In conclusion, the project successfully demonstrates the potential of integrating deep learning and image processing techniques to recognize and interpret ancient language characters from stone inscriptions. By utilizing the contour-let transform for feature extraction and convolutional neural networks for classification, the system achieved reliable accuracy in identifying characters and predicting their historical era. The implementation of a user-friendly web application further enhanced accessibility, allowing researchers and historians to analyze inscriptions effectively. This innovative approach not only automates a traditionally manual and time-consuming process but also contributes significantly to the preservation and understanding of ancient languages and cultural heritage..

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