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MODI LIPI HAND WRITTEN CHARACTER RECOGNITION USING CONVOLUTIONAL NEURAL NETWORKS (CNN)

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ABSTRACT

An ancient Indian script from Maharashtra is called MODI. During Chhatrapati Shivaji Maharaj's rule, this script was frequently used to create official documents. The structural characteristics of MODI make character recognition challenging, and there is no image database. In this study, we built a CNN model for character recognition and extended the dataset of the MODI script using data augmentation methods. Due of the low picture dataset multiple images provided by the MODI script, we added data to the dataset and trained the CNN model on a created dataset. About 91.62% of the time, the trained model correctly recognizes Handwritten MODI characters.

Keywords: Convolutional Neural Network, Data augmentation techniques, Deep Learning algorithms, Word recognition, Image Processing.

I. INTRODUCTION

Modi Is A Brahmi-Based Script That Is By And Large Used For Writing Marathi. Modi Script Was Once Regularly Used Till 1950 When All And Sundry Switched To The Devanagari Script. The Modi Script Used To Be Used To Write Reputable Documents, Cultural Literature, And Spiritual Books. However, Most Men And Women Are Unaware Of The Script. The Find Out About In This Paper Targeted On Handwritten Persona Identification Andtransliteration To Marathi Script. The Modi Script Dates Again To The Twelfth Century And Used To Be Used Till The Twentieth Century. Shivkalin And The Peshava Kalin Kingdom Have Each Used Modi Script. As Time Passed, Quite A Number Modifications Have Been Made To The Varieties Of Writing Of Modi. In The Twelfth Century, Modi Script Used To Be Referred To As "Adyakalin", And In The Thirteenth Century, It Advanced As A New Script Regarded As "Yadav Kalin". The "Bahamanikalin" Of The 14th-16th Centuries Is The Subsequent Section Of Development, Observed Through The "Shiva Kalin" Of The Seventeenth Century. Modi's Last Stage Is Associated To English Rule And Is Regarded As "Anglakalin". From 1818 To 1952, This Fashion Of Writing Used To Be In Use.

Modi Used To Be Additionally Used In Basic College Textbooks Posted In The Nineteenth And Twentieth Century. Then Devanagari Script Commenced To Exchange Modi Script In The Twentieth Century. The Bombay Presidency Determined On July 25, 1917, To Substitute The Modi Script With The Bal Bodh Fashion Of Devanagari As The Main Administration Script For Ease And Consistency With The Different Areas Of The Presidency.

Thousands Of Modi Archives Have Been Saved In South Asia And Europe. Due To The Presence Of These Europeans In Tanjore, Pondicherry, And Different South Asian Locations At Some Stage In The Nineteenth Century, The Majority Of These Are Saved In A Number Archives In Maharashtra, Though Lesser Collections Are Saved In Denmark And Different Nations. The Earliest Surviving Modi Record Is From The Early Seventeenth Century. While The Majority Of Modi Papers Are Authentic Letters, Land Registry, And Different Administrative Documents, Earlier Than The 1950s, The Script Was Once Additionally Utilized In School, Journalism, And Different Everyday Activities.

Modi Script Customers Are Presently Publishing Books And Publications In The Script On A Normal Basis. Several Groups Presently Grant Modi Tutorials, Ranging From Weekend Workshops Held Via The Maharashtra State Department Of Archives To Legitimate Publications Supplied Through Bharat Itihas Samshodhak Mandal

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(Bism) In Pune. Some Schools Additionally Furnish Modi Certifications That Are Diagnosed By Using The Maharashtra Government. The Indian Authorities Has Set Apart Money For The Indexing Of These Archives, Which Is Being Carried Out Through Groups Freshly Educated As Modi Specialists. Modi Customers Have Created Laptop Help For The Script, Mainly In The Structure Of Digitized Typefaces. However, Due To The Absence Of A Character-Encoding Widespread For The Script, Customers Count On Old-Fashioned Encodings Or Are Linked To Unicode Blocks Such As Devanagari.

Fig 1: Sample Letter of MODI Lipi

II. METHODOLOGY

System Architecture

The system architecture diagram for the MODI Lipi Handwritten Character Recognition Using Convolutional Neural Networks (CNN) project depicts the overall structure of the system and its components. Below diagram shows system architecture of the overall system.

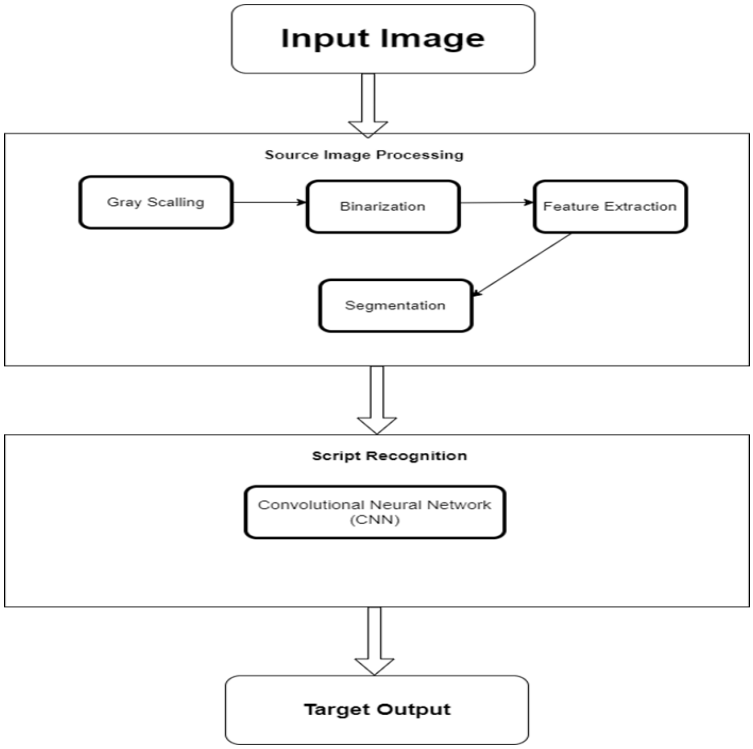

Fig 2: System Architecture Diagram

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Gray Scaling

It is a digital photography technique for image conversion. All color information is removed, leaving only various shades of grey, with white being the lightest and black being the darkest.

Binarization

Any grayscale (multi-tone) image can be turned into a black-and-white (two-tone) image using the binarization technique. To do the binarization procedure, first determine the grayscale threshold value and determine if a pixel has a specific grey value or not.

Feature Extraction

The dimensionality reduction method, which divides and condenses a starting set of raw data into smaller, easier-to-manage groupings, includes feature extraction. As a result, processing will be simpler.

Segmentation

By dividing a digital image into several subgroups (of pixels) known as Image Objects, a technique known as segmentation, the complexity of the image can be reduced, making image analysis easy.

Convolutional Neural Network (CNN)

It is a deep learning system that uses an image as input to priorities different elements in the picture and tell them apart. CNN performs the majority of the pre-processing itself, in contrast to other algorithms that demand pre-processed images for additional processing.

The structure of the visual cortex serves as a model for CNN, and its connectivity pattern closely resembles that of the brain's nerve cells.

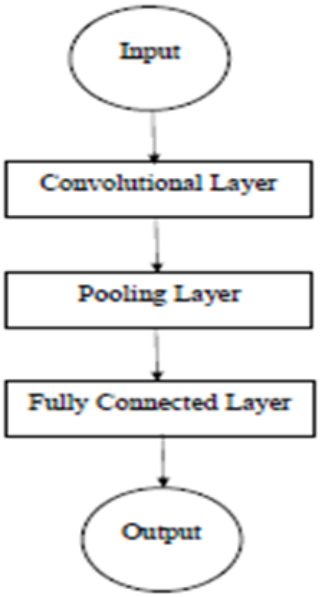

Fig 3: Convolutional Neural Network Diagram

Convolutional layer

The majority of processing takes place in the convolutional layer, which is the central component of a CNN. Among other things, it requires input data, a filter, and a feature map. Let's presume that the input will be a color image that consists of a pixel matrix.

Pooling layer

A two-dimensional filter is slid over each channel of the feature map during the pooling operation, and the features contained within the region covered by the filter are summarized.

Fully Connected layer

A neural network with fully connected layers is one in which each neuron uses a weights matrix to apply a linear transformation to the input vector. As a result, every input of the input vector influences every output of the output vector, making all conceivable linkages layer to layer present.

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Data Augmentation

A machine learning model always performs well when given a lot of data. In general, the model performs better the more data we have. When creating an efficient image classifier with relatively little training data, picture augmentation is frequently required to improve the performance of the machine models. Image augmentation methods were applied Using different processing techniques or a combination of different processing techniques, such as random rotation, shifting, shearing, and flipping, etc., image augmentation creates training images artificially. Fig. displays a few enhanced photos from the generated dataset. The original image is on the left, while the others were produced utilizing augmentation methods. These images are generated from training data, so we don't need to manually take them.

Flipping

With this method, we can flip photographs in any direction we like, including up-and-down and left-to-right. Flipping an image.

Fig 4: Sample Images of Flipping

Noising

We use this method to artificially add noise to the images. This approach allows us to train our model to distinguish between noise and image data. This method might help strengthen your model's resistance to image changes.

Fig 5: Sample Image of Noising

Blurring

It is not necessary for all of the photographs to be of the same caliber when we gather data from various sources. While some pictures might be of very good quality, others might be of very low quality. Since the source pictures can be warped in this scenario, our model is more resilient to changes in image quality.

Fig 6: Sample Image of Blurring

III. MODELING AND ANALYSIS

The below table shows the description of the modules which are implemented in the system:

Table 1: Description of the Modules

Sr. No.	Module Name	Description
1	**Upload**	This module is implemented to upload the image stored in our machine and/or downloaded from any website. This button performs following tasks: 1. Opens Window Asks to select the image with extension jpeg, jpg, png. 2. Opens the selected image
2	**Transcript**	This module is implemented to transcript the image which is uploaded by the user to the application. This button performs following tasks: 1. Transforms uploaded image to 96*96 size 2. Transcripts the selected image to Marathi Devanagari 3. Gives output in Marathi Devanagari

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		4. Prints the prediction rate in percentage
3	**Save**	This module is implemented to save the transcribed result. This button performs following tasks: Opens Window Ask to select the path Asks to enter the file name Saves the file at the entered path and given name as a text format
4	**Exit**	This module is implemented in application to serve the purpose of allowing users to close or exit the application.

IV. RESULTS AND DISCUSSION

Our research on identifies MODI script language and convert into Marathi regional language. so we can collect multiple picture from internet and from other resources. That finding data collect and create dataset and train data using google Collab and Jupiter. That Dataset is in blur and noise format to solve this problem we use deep learning CNN algorithm method. This method helps to identify blur and noisy images or dataset. And find actual character or words.

Our result is Train accuracy is 98.62% and train loss 4.10 and test accuracy is 96.58 and test loss 13.47.

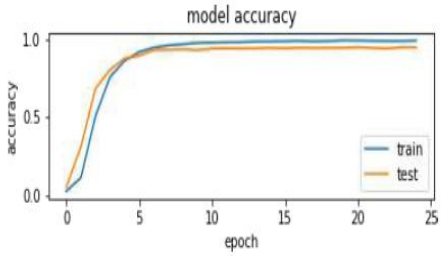

Fig 7: Train and Test Accuracy

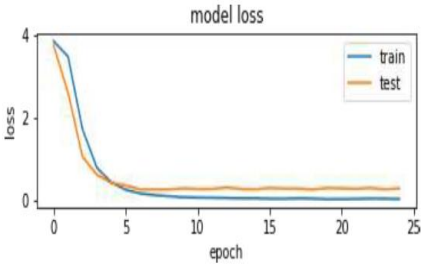

Fig 8: Train And Test Loss

Data Rate

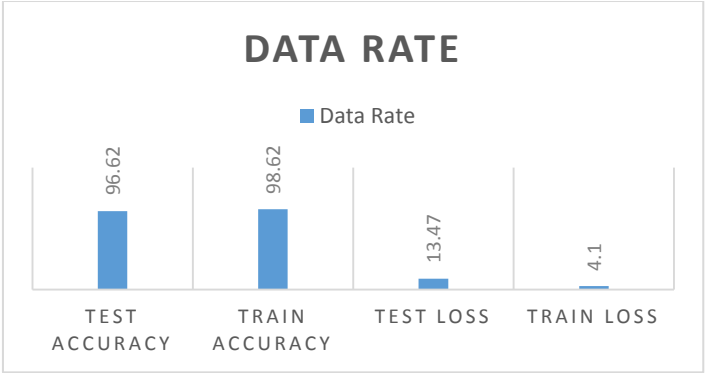

Fig 9: Diagram of Data Rate

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Final Result of the application

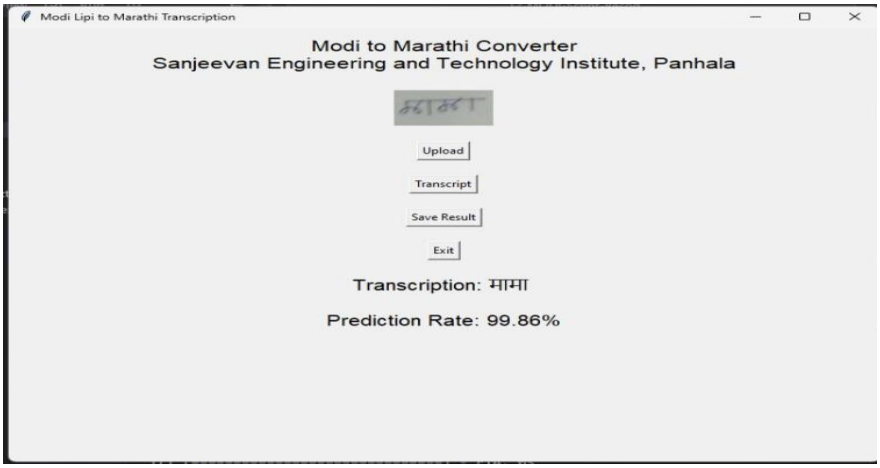

Fig 9: Screenshot of Final Result of Application

V. CONCLUSION

A standard Convolutional Neural Network for MODI character identification serves as the research's model. The maximum accuracy obtained with the traditional CNN method is 96.58 percent. Additionally, the method is examined for different picture alterations. Future research could expand on this identify paragraph or old documents.

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