

English Handwritten Character Recognition using LAMASTAR Neural Network

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Abstract: Handwriting recognition is highly researched area from several years with different techniques. In handwriting recognition technique there are two methods one is online method and other is offline method. Image recognition is main aspect of handwriting recognition process. In image recognition size of image, angle of image and quality of the image these are the things taken care of precisely. To make machines more intelligent, the developers are dividing into to technologies like machine learning and deep learning techniques. A human can learn to perform a task by practice and repeating it repeatedly so that it memorizes how to perform the task. Then the neurons in his brains automatically trigger and they can quickly perform the task they have learned. Deep learning is also very similar to this. It uses different types of neural network architecture for different types of problems. Convolution neural Network (CNN) is very effective technique when it comes to image recognition and handwriting.

Keywords: Handwriting Recognition, Human Intelligence, Deep Learning, Machine Learning, CNN

1. INTRODUCTION

Handwriting Recognition is the ability of machine to recognize and predict the human handwritten character. It is a very tedious task for machine because handwritten letters, digits or characters are not perfect and can be made with many different flavors. So, this paper is solution in which handwritten characters are recognize and predict with accuracy. Handwriting Detection is a technique or ability of a computer to receive and interpret intelligible handwritten input from source such as paper documents, touch screen, photo graphs etc. Handwritten Text recognition is one of area pattern recognition. The purpose of pattern recognition is to categorizing or classification data or object of one of the classes or categories. Handwriting recognition is defined as the task of transforming a language represented in its spatial form of graphical marks into its symbolic representation. Each script has a set of icons, which are known as characters or letters, which have certain basic shapes. The goal of handwriting is to identify input characters or image correctly then analyses to many automated process systems. This system will be applied to detect the writings of different format. The development of handwriting is more sophisticated, which is found various kinds of handwritten character such as digit, numeral, cursive script, symbols, and scripts including English and other languages. The automatic recognition of handwritten text can be extremely useful in many applications where it is necessary to process large volumes of handwritten data, such as recognition of addresses and postcodes on envelopes, interpretation of amounts on bank checks, document analysis, and verification of signatures. Therefore, computer is needed to be able to read document or data for ease of document processing. There are many techniques by using them we can achieve recognition. It involves Convolutional Neural Network (CNN), Semi Incremental Method, Incremental Method, Line and Word Segmentation etc., One of the most effective and prominent way of handwriting recognition is convolutional neural network (CNN). It is a part of deep learning. CNN is most used in analyzing visual imaginary. Convolutional Neural Network (CNN) are composed of artificial neurons.

2. LITERATURE SURVEY

Nisha Sharma *et. al.* [1] proposed off-line character recognition of hand printed document images using neural network (NN) and Support vector machine SVM. Classification was done using Multilayer perception neural network (NN) with back propagation and Support vector machine (SVM) classifier. The system for combined data set of Characters, Numerals and Special Symbols

J.Pradeep *et. al.* [2] described neural based off-line handwritten character recognition system, without feature extraction. In this system, each character is resized into 30x20 pixels, which is directly subjected to training. That is, each resized character has 600 pixels and these pixels are taken as features for training the neural network. The results show that the proposed system yields good recognition rates which are comparable to that of feature extraction based schemes for handwritten character recognition.

Subhash Panwar *et. al.* [3] introduced bottom up grouping approach for segmentation. It used a novel connectivity strength parameter with depth first search approach for extraction of connected components of the same line from complete connected components of the given document. The exact sequence of connected components is stored in the sequential vector which contains the label of the components. Result shows that this approach gives better results compared to existing segmentation techniques and overcomes the problems encountered in Hill-and-dale writing styles and overlapped and touched lines.

Amit Goyal *et. al.* [4] anticipated self-organizing map for feature extraction of alphabets, thus the relative feature of them are automatically defined based on arrangement of the competing units. Used data structure and algorithm reduced the SOM computational complexity by several orders of magnitude.

Prasad. P. Chaudhari *et. al.* [5] Recommended Grid approach for recognition of offline handwritten character. In this technique first extract feature from pattern and then extracted features are used to train neural network. The proposed work is based on the pattern matching. A multilayer feed forward network is used for classification rate. The average success rate of algorithm in recognition is 96.9%. Reetika Verma *et. al.* [6] Mentioned surf feature extraction, Surf feature matching and Neural network techniques for character. SURF adopts nearest neighbor. The purposed of feature point matching is to find up the feature point from the same location in two images and matches a couple of feature points. In this paper it presents a fast matching method. It detected the feature points to match the selected part. The better accuracy is obtained by combining NN and SURF. Theingi Htike *et. Al* [7] used Competitive Neural Trees (CNeT). Shape features descriptors are extracted from processed image which are used in CNeT. The trained dataset are 660 and testing datasets are 330. Recognition accuracy rate is 97% With testing dataset 330. Uses of self-organizing map for feature extraction of alphabets, thus the relative feature of them are automatically defined based on arrangement of the competing units. Proposed data structure and algorithm reduced the SOM computational complexity by several orders of magnitude. Kohonen maps or SOMs are one of the most popular learning strategies among the several Artificial Neural Network algorithms. The result of this system shows better recognition performance in terms of accuracy and speed as compared to NN. A general trend of increase in performance with increase in samples is observed. The author suggests to explore the necessity to create optimization algorithm to increase the performance of the system. Sandeep Saha *et. al* [8] presented 40-point feature extraction and Artificial Neural Network. Training set consist 780 images and 260 images testing set. Classification is done using a Neural Network (MLP: multi-layer perceptron). MLP consists of 40-elements feature vector for each character and 26 outputs for alphabets. The overall accuracy obtained is 83.84%

3. IMPLEMENTED ALGORITHM

To achieve the recognition of handwritten character or letters we proposed a system which includes recognition through Convolutional Neural Network (CNN). This process is categorized into two phases first is learning of model, in which model is trained and saved and later used when it needed to recognition. Second phase is actual working of model where we get expected result through GUI. Fig. 1: shows different phases of includes in Working process of model.

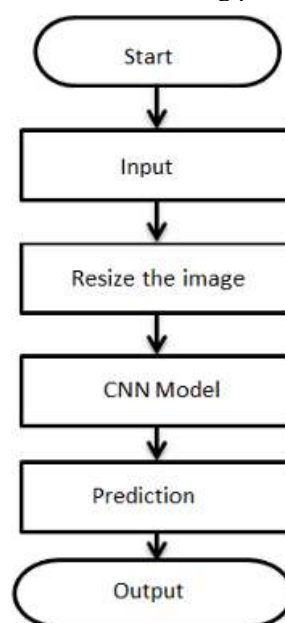


Figure No. 1: Working of Model

In actual working, the input is provided through GUI. Now, for the GUI , we have created a new file in which we build interactive window to draw character on the canvas and with a buttons through which we can recognize the character. For generating GUI we have used the Tkinter library for python. Tkinter is a standard GUI library for python. It provides fast and easy way to create GUI

application. After providing the input it proceed to prediction through the model we load and saved model.h5 file. The given input is advances further in order to resize in particular format to get actual prediction. Next the resize image is moved further for prediction model where feature extraction of given input is takes place. After that the modelling results in prediction that represents the probability of the target variable based on estimated significance from the set of input variable The expected results are shown on GUI application. The output will contain expected characters with position in order to 0-26 and accuracy of predicted output.

4. Result Analysis

Following are results of handwritten character recognition. The results are shown on GUI where it shows the predicted character with position and accuracy of prediction.



Figure No. 2 Output of the Character D and E

5. CONCLUSION

The project presented a Convolutional Neural network approach to recognize the various handwritten characters. In this project classification of characters takes place. The project is achieved through the conventional neural network. The accuracy we obtained in this is above 90%. This project will provide both the efficiency and effective result for the recognition. The project gives best accuracy for the text which has less noise. The accuracy completely depending on the dataset if we increase the data, we can get more accuracy. If we try to avoid cursive writing then also its best results. In future we are planning to extend this study to a larger extent where different embedding models can be considered on large variety of the datasets. The future is completely based on technology no one will use the paper and pen for writing. In that scenario they used write on touch pads so the inbuilt software which can automatically detects text which they writing and convert into digital text so that the searching and understanding very much simplified.

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