

Handwritten Character Recognition Using Neural Network

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Abstract:

Handwritten character recognition is the well-known research area in several fields, like writers identification, bank cheques, and so on. Literature works present the hand written character recognition for various languages. Proposed a convolution neural network algorithm for hand written character recognition. Initially, the noise in the input image is removed using the median filter, and the image is segmented and Then, the feature extraction, and recognition are extracted from the input image. System must provide the better quality of service to user and provide better accuracy for character recognition.

Keywords: Convolution Neural Network, Adaptive Moment Estimation technique, Keras Module, Pandas, NumPy.

1. Introduction

The main aim of this work is to design expert system for “HCR (English) using Neural Network” that can effectively recognize a particular character of type format using the Convolution Neural Network approach. In handwriting recognition (HWR) the device interprets the user's handwritten characters into a format that the computer understands. This paper is aimed at developing software which will be helpful in recognizing characters of English language. Handwritten character recognition (HCR) is the detection of characters from images, documents and other sources and changes them in machine-readable

shape for further processing. The accurate recognition of intricate-shaped compound handwritten characters is still a great challenge.

Recent advances in convolutional neural network (CNN) have made great progress in HCR by learning discriminatory characteristics from large amounts of raw data. In this paper, CNN is implemented to recognize the characters from a test dataset. The main focus of this work is to investigate CNN capability to recognize the characters from the image dataset and the accuracy of recognition with training and testing. CNN recognizes the characters by considering the forms and contrasting the features that differentiate among characters. Our CNN implementation is experimented with the dataset MNIST to obtain the accuracy of handwritten characters. Test result provides that an accuracy of 97.83% accuracy is obtained on 200 images with a training set of 1000 images from MNIST. English alphabets from A-Z. This we are going to achieve by modeling a neural network that will have to be trained over a dataset containing images of alphabets.

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This is an overview of the most recent published approaches to solving the handwritten character recognition problem. This paper is aimed at clarifying the role of handwritten character recognition in accordance with today's maturing technologies. We will recognize handwritten characters, i.e.

2. Literature Survey

S. No	Title	Methodology	Performance Matrix	References
1	A Recognition System For Handwritten Gurumukhi Characters	Back Propagation Classifier	98%	[1]
2	Offline Handwritten English Numerals Recognition using Correlation Method	Correlation Method	95%	[2]
3	Recognition of Handwritten Hindi Characters using Back Propagation Neural Network	Back Propagation Neural Network	93%	[3]
4	Devanagari Character	Neural Network	90.2 %	[4]

	Recognition Using Neural Networks			
5	Intelligent Systems for Off-Line Handwritten Character Recognition: A Review	Image Processing	90%	[5]
6	Fuzzy Based Handwritten Character Recognition System	Fuzzy Based Algorithm	89%	[6]
7	An Overview of Character Recognition Focused on Off-Line Handwriting	CR Method	89%	[7]
8	Handwritten Devanagiri Character Recognition Using Neural Network	Neural Network	88%	[8]
9	Image pre-processing for optical Character Recognition	Neural Network	87%	[9]
10	Recognition for Handwritten English Letters: A Review	Image Preprocessing	75%	[10]

3. Methodology

3.1 Proposed Model:

The purpose of this paper is to take handwritten English characters as input, process the character, train the convolution neural network algorithm, to recognize the pattern and modify the character to a beautified version of the input. This paper is aimed at developing software which will be helpful in recognizing characters of English language. This paper is restricted to English characters only. It can be further developed to recognize the characters of different languages. The neural network is presented with a target vector and also a vector which contains the pattern information, this could be an image and hand written data. A neural network trained for classification is designed to take input samples and classify them into groups. This paper concerns detecting free handwritten characters.

3.2 Proposed Algorithm:

The Adaptive Moment Estimation (ADME) technique optimization algorithm is an extension to stochastic gradient descent that has recently seen broader adoption for deep learning applications in computer vision and natural language processing. ADME technique is an optimization algorithm that can be used instead of the classical stochastic gradient descent procedure to update network weights iterative based in training data.

The attractive benefits of using ADME technique on non-convex optimization problems, as follows:

- ✓ Straightforward to implement.
- ✓ Computationally efficient.
- ✓ Little memory requirements.

- ✓ Invariant to diagonal rescale of the gradients.
- ✓ Well suited for problems that is large in terms of data and/or parameters.
- ✓ Appropriate for non-stationary objectives.

3.3 Deep Learning:

Deep learning is an emerged and effective tool for analyzing big data. It uses complex algorithms and artificial neural networks to train machines or computers. So that they can learn from experience classify and recognize data or images just like a human brain does. Within Deep Learning, a Convolutional Neural Network or CNN is a type of artificial neural network, which is widely used for image or object recognition and classification. Deep Learning thus recognizes objects in an image by using a CNN. CNNs are playing a major role in diverse tasks or functions like image processing problems, computer vision tasks like localization and segmentation, video analysis, to recognize obstacles in self-driving cars, as well as speech recognition in natural language processing. As CNNs are playing a significant role in these fast-growing and emerging areas, they are very popular in Deep Learning.

4. Result Analysis

“HCR Using Neural Network” is aimed at recognizing the handwritten characters. The “handwritten Character Recognition System” is implemented using a neural network. In this system original image is converted into grey scale image then After grey scaling image is converted in black and white and segmented form. After preprocessing and segmentation operation system show final output.

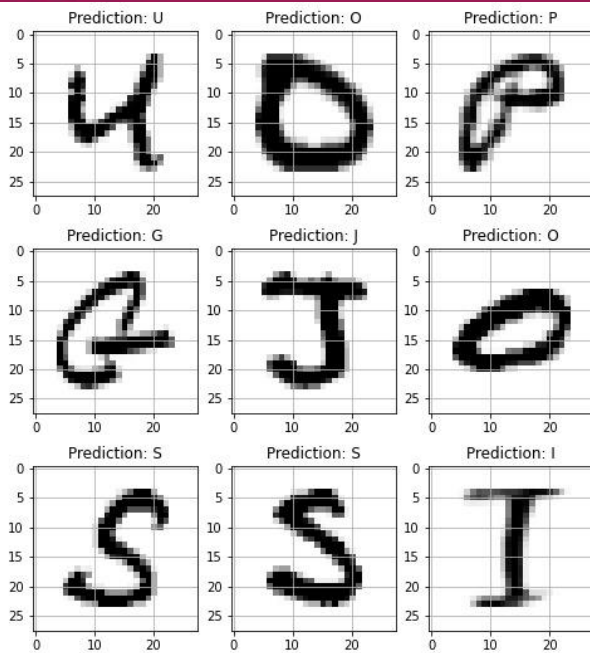


Figure 1: Output from dataset.

handwritten character recognition ---



Prediction: C

Figure 2: Output from external image.

5. Conclusions

Many regional languages throughout world have different writing styles which can be recognized with HCR systems using proper algorithm and strategies. We have learning for recognition of English characters. It has been found that recognition of handwritten character becomes difficult due to presence of

odd characters or similarity in shapes for multiple characters. Scanned image is pre-processed to get a cleaned image and the characters are isolated into individual characters. Preprocessing work is done in which normalization, filtration is performed using processing steps which produce noise free and clean output. Managing our evolution algorithm with proper training, evaluation other step wise process will lead to successful output of system with better efficiency. Use of some statistical features and geometric features through neural network will provided better recognition result of English characters. This work will be helpful to the researchers for the work towards other script.

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